A

TREATISE

ON

The Operations for the Formation

OF AN

ARTIFICIAL PUPIL;

IN WHICH THE MORBID STATES OF THE EYE REQUIRING THEM, ARE CONSIDERED;

AND

The Mode of performing the Operation, adapted to each peculiar Case, fully explained;

WITH

AN ACCOUNT OF THE OPINIONS AND PRACTICE OF THE DIFFERENT FOREIGN AND BRITISH AUTHORS WHO HAVE WRITTEN ON THE SUBJECT.

With Two Copper-plates.

BY G. J. GUTHRIE,

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TO THE

VICE-PRESIDENTS

OF THE

ROYAL WESTMINSTER INFIRMARY

FOR THE

Cure of Diseases of the Eye,

TO WHOSE LIBERALITY THE INSTITUTION IS PRINCIPALLY INDEBTED FOR ITS ORIGIN AND SUPPORT,

THIS WORK

IS RESPECTFULLY AND GRATEFULLY INSCRIBED BY

THEIR VERY OBEDIENT

AND HUMBLE SERVANT,

G. J. Guthrie.

THE

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FOR

The Cure of Diseases of the Eye,

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PREFACE.

DURING the last three years that the Royal Westminster Infirmary for the Cure of Diseases of the Eye, has been established in Mary-le-bone Street, Piccadilly, my colleague Dr. Forbes, the Physician to the Institution, and I, have devoted a part of our respective Courses of Lectures, on the Principles and Practice of Physic and Surgery, to the Diseases of the Eye, in order to render this branch of the healing art, more intelligible to students; and to remove some of the difficulties which have prevented its being studied by practitioners. The limits of a course of lectures have not permitted us to enter so fully into historical details and theoretical opinions as we could have wished, although prac-

tical facts, and opinions have never been neglected. The students have felt this, as well as the want of a work, on the Diseases of the Eye, which, whilst it noticed the doctrines and practice of the several writers on the subject, should state the facts and impartially discuss the opinions of each; so as to obviate the necessity for purchasing several books on the same subject, merely because each Author has chosen to recommend only his own practice, or methods of operating.

On the subject of Artificial Pupil, there is no book in the English Language which exhibits the opinions of foreign authors in a connected manner, and when they are hinted at, in some books, it is frequently in an erroneous manner; or the value of them is so much underrated or exaggerated, that it becomes very desirable the English reader should be better acquainted with them. To gain any thing like a tolerable acquain-

tance with the subject at present, a student must possess at least three books; Scarpa on the Diseases of the Eye; Mr. Gibson, and Sir W. Adams on the Operations for Artificial Pupil; which is a serious inconvenience.

With the hope of lessening the evil, this book was written. I have avoided entering into any unnecessary controversy, and where I have thought it right to combat the opinions, of either the dead or the living, I have endeavoured to do it with liberality. I have stated the facts on both sides as fairly as I was able and then drawn my inferences from them. I have also endeavoured to give to every one his own, and if I have failed towards any one, I shall be most willing to rectify the error on the slightest suggestion, whenever an opportunity shall be given me.

The observations which have been made on the different states of disease, and

on the methods of operating, have been almost entirely from cases immediately under my own care, but which I have not detailed at length, because it would have tended to enlarge the work, without adding to its utility.

It was originally intended that this book should have been published at the same time as a Treatise on Cataract, and on Inflammation of the Iris, but an accidental circumstance, having retarded that work for a few weeks, I thought it would save time and trouble, to print this one first.

I have to offer my acknowledgments to my friends Mr. Bernard Van Oven, for a translation of the Chapter on Artificial Pupil, from the Work of Professor Bëer, which I had not at that time in my possession; and to Mr. Thomas Bishop for the drawings of the plates attached to this book.

2, Berkeley Street, Berkeley Square.
24th November, 1819.

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CONCLUDING OBSERVATIONS

ON

The Operations for the Formation

OF AN

Artificial Pupil.

THE different methods of restoring vision in every case in which the defects requiring it, exist in the lens or its capsule, are denominated "Operations for Cataract." When the disease is not confined to these parts, but combined with derangement of the structure and function of the iris, so as to produce a complete obliteration, or partial closure of the natural pupil, sufficient to prevent vision; the modes of affording relief are usually termed in this country "Operations for Artificial Pupil." This term, corresponding with the essential part of the operation, and conveying, more than any other, a precise idea of its nature, as well as of the cause which renders it necessary. The formation of an artificial pupil may be required from a variety of causes, either external, internal, or combined; and the mode of performing

the operation must vary according to the cause and nature of the morbid state requiring it; no one method being applicable to every variety of disease, any more than in cataract. We find, however, on enquiring into the history of this operation, that the same predilection for one method has prevailed in all cases nearly as much as in cataract, and with the same bad effect; although it must have been obvious, that, by adopting more liberal and scientific views of the means of cure, by adapting these means to the end, the results would have been more fortunate. But, the idea of the necessity of a particular method, peculiar to each oculist, pervaded every branch of this art, for a long time, and very much retarded its improvement. For, if one mode of operating would not answer in every case, it was either abandoned from being found useless where it should never have been tried, or estimated too slightly from the paucity of cases in which it was really found to be efficient. This was not all, for from the want of due discrimination, in the application of those operations, many have lived for years in misery, who might easily have been restored to comparative happiness. Fortunately this dark period of the art has passed, and every surgeon of professional ability, although he does not undertake the treatment of diseases of the eye, makes himself acquainted with their pathology, and the various methods adopted for their cure.

Of the different methods of forming an Artificial Pupil.[a]

There are four successful methods of forming an artificial pupil, and two which are doubtful; all subject to particular modifications.

1. By division of the iris either through the sclerotica, or through an opening in the cornea, called by foreign authors Coretomia,[b] (properly) Corotomia,* Coretotomia,[c] (less correctly). Iridotomia.[d] Being the operation invented by Cheselden,[e] recommended by Morand[f] and Sharpe,[g] and afterwards abandoned. Having been denied by Lassus,[h] supposed by Cloquet,[i] to have been merely a division of the membrana pupillaris, and again restored by Sir W. Adams,[j] being effected through the sclerotica. Recommended

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[a] Called by continental authors, especially Wagner and Langenbeck, Coremorphoseos. Κόρη (pupilla) et Μορφωσις (formatio).

[b] By Himly, from Κόρη pupilla oculi. et Τομὴ (sectio.)

* By Bëer.

[c] By Schmidt.

[d] By Wagner, Commentatio de Coremorphosi. Göettingæ, 1818, from Ἶρις ἴδος (iris) et Τομὴ (sectio).

[e] Cheselden. Philosophical Transactions, 1728.

[f] Morand. Eloge de M. Cheselden, inséré dans les Memoires de l'Academie de Chirurgie. Tome 2 in 4to.

[g] Sharpe's Surgery.

[h] Lassus. Pathologie Chirurgicale. Paris.

[i] Cloquet Jules. Memoire sur la Membrane pupillaire. &c. Paris, 1818.

[j] Adams. W. on Artificial Pupil, &c. 1812.

by Janin,[a] Guerin, Richter,[b] Pellier,[c] Plenck,[d] Bëer,[e] Maunoir,[f] et Jurinne,[g] Faure,[h] Flajani,[i] Montain,[k] Gleize,[l] Ryan,[m] through the cornea.

2. Excision of the Iris. When a portion of it is cut out through an opening in the cornea, which may be done by several methods, called by continental authors Corectomia[m] (properly) Coretonectomia (less correctly) and Iridectomia, being the different operations recommended by Wenzel,[n] Ware,[o] Gendron,[p] Demours,[q] Bëer, Sa-

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[a] Janin. Memoires Sur l'Oeil. Lyon, 1722.

[b] Richter. Anfangsgründe der Wundarzneikunst. B. 3

[c] Pellier de Quingsy. Memoires sur les Maladies de l'Oeil. Montpellier, 1783.

[d] Plenck. de Morbi Oculorum, 1777.

[e] Bëer. Ansicht der Staphylomatösen Metamorphosen des Auges, &c. Vienna, 1806, Lehrbuch von den Augenkrankheiten, 1817.

[f & g] Maunoir. Sur l'Organisation de l'Iris. Paris, 1812, and Prof. Jurinne of Geneva.

[h] Faure. Observations sur une Pupille Artificielle. Paris, 1814.

[i] Flajani. Collezione di Osservazioni, t. iv.

[k] Montain. Journal de Medicine, par Leroux. Paris, 1817.

[l] Gleize. Nouvelles Observations pratiques sur les Maladies de l'Oeil, et leur traitement. Orleans, 1812; 1st edit. 1786.

[m] Ryan. On Artificial Pupil. Dublin Hospital Reports, 1818.

[n] Himly Corectomia, from Κόρη (pupilla) et Εκτομή (exsectio)

[o] Wenzel. See also the late Mr. Ware on Cataract.

[p] Gendron. Louis Deshais Florent. Traité des Maladies des yeux, 1770.

[q] Demours. Traité des Maladies des yeux. Tome 3. Paris, 1818.

batier,[a] Arneman, Saunders, Forlenza,[b] Benedict,[c] Gibson[d] Muter,[e] Travers, Sir W. Adams,[f] Quadri, Ryan. . . .

3. Separation of the Iris.—When the iris is separated from its attachment to the ciliary ligament in any part of its circumference, with, or, without strangulation of the separated portion in the external incision, whether by operation through the sclerotica, or, through an opening in the cornea, called by continental writers, principally in Germany, Coredialysis,[g] (properly) Corodialysis,* Coretodialysis,[h] (less correctly) and Iridodialysis,[i] being the different operations recommended by Schmidt,[k] Scarpa,[l] Assalini,[m]

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[a] Sabatier. Medicine Operatoire, Paris, tome 3.

[b] Forlenza of Naples. Considerations sur la Pupille Artificielle. Strasbourg, 1805.

[c] Benedict. De Pupilla Artificialis conformatione libellus. Leipsic, 1810.

[d] Gibson on Artificial Pupil, 1811.

[e] Muter on Cataract and Artificial Pupil, 1811.

[f] Sir W. Adams on Artificial Pupil, 1819.

[g] By Himly, from Κορη pupilla, et Διάλυσις (dissolutio)

[h] by Schmidt. [i] by Wagner. * By Beer

[k] Schmidt, 1802, in Schmidt and Himly's Ophthalmologischer, Bib. Band 2. Stück 1.

[l] Scarpa, 1801, On the Diseases of the Eye, 1st. edition 2nd edition, 1819, by Briggs.

[m] Assalini. Ricerche sulle Pupille Artificiali. Milan, 1811,

[n] Buzzi in Assalini.

Quadri. Anotazioni pratiche sulle malattie degli occhi. Naples, 1818.

Buzzi,[n] Himly,[a] Bëer, Buckhorn,[b] Bonzel,[c] Langenbeck,[d] Richerand,[e] Frattini,[f] Reisinger[g] Graëfe,[h] Walther,[i] Wagner, Embden,[k] Dzondi,[l] Zengs,[m] Schlagintweit.[n]

4. Separation and excision combined. The iris being first separated from the ciliary ligament, and a portion of the separated part removed through an opening in the cornea, being

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[a] Himly in Himly and Schmidt's Ophthalmologischer. Bibliothek Bd. 3. Stück 2.

[b] Buckhorn. Dissertatio de Keratonyxide. Halle, 1806

[c] Bonzel, of Rotterdam in Hufeland's Journal der Practischer Heilkunde. Stuck. 2, 1815.

[d] Langenbeck Neue Bibliothek für die Chirurgie, &c. 1 vol. 3 part and 4 part, sec. 2. p. 676. Goëttingæ. 1819.

[e] Richerand Nosographie Chirurgicale. *Paris.*

[f] Frattini. Sulla maniera di formare la Pupille Artificiali. Parma, 1816.

[g] Reisinger. Darstellung, &c. und einer leichten und sichern methode küntsliche pupillen zu bilden. Augsburg, 1816.

[h] Graefe das Coreoncion. von Ch. Jüngken. Berlin, 1817.

[i] Walther. Merkwürdige Heilung, eines eiterauges nebst Bemerkung über die operation des Hypopyon.

[k] Embden. De Raphiancistro, &c. &c, Goëttingæ, 1818

[l] Dzondi. Kurtze Geschichte des Klinischen Institutes für die Chirurgie, &c. Halle, 1818.

[m] Zengs, Darstellung blutiger heilkundiger operationen 2nd part. *Wien.*

[n] Schlagintweit. Uéber den gegenwärtigen Zustand der kunstlichen pupillenbildung in Teutschland. Munich, 1818.

the operation recommended by Assalini, Reisinger.

The hitherto unsuccessful methods are

1. Removing a portion of the sclerotica, and choroid coats close to the cornea, where that part is perfectly opaque, so as to allow the rays of light to pass into the eye. Autenrieth.[a]

2. Separation and division of the iris, through the same opening in the sclerotica. Donegana,[b] with excision. Muter.

History of the Operation for Artificial Pupil.

The idea of forming an Artificial Pupil owes its origin to Mr. Cheselden, previous to whose time, a closed pupil was considered irremediable. The information we derive from Cheselden himself, is to be found in the Philosophical Transactions for 1728. But he does not seem to have performed the operation on the person whose history he relates, but rather to have added to it, an account of a particular operation, which he considered worthy of record, yet not sufficiently important to become the subject of a separate memoir; and from

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[a] Autenrieth. In Ephemeridibus Tubingæ. Wagner, Foreign Medical Journal, No. 4.

[b] Donegana. Ragionamento sulla pupille artificiali. *Milan*, 1809.

inattention to this circumstance, several errors of considerable magnitude have been made. He describes the operation in the following words, with reference to a plate: "C is a sort of needle with an edge on one side, which being passed through the tunica sclerotis is then brought forwards through the iris a little farther than E. This done, I turn the edge of the needle, and cut through the iris as I draw it out." In this case the opening was made in a line with the transverse diameter of the iris, but in cases complicated with cataract, he recommended it to be made a little above or below, (as Sharpe did after him) with the view of avoiding the lens, which he supposed to be smaller than in the transparent state, and so adherent that it could not be detached from the iris, without exciting too much inflammation; an opinion adopted possibly from generalizing too much, and which a wider range of experience, had he lived, would doubtless have induced him to alter.

Morand says, that Cheselden had not sufficiently detailed his method of operating in his paper in the Philosophical Transactions, and gives the following description of it, as he saw Mr. Cheselden perform it in London.—"He made an incision in the middle of the iris with a kind of needle, larger and less pointed than that for cataract, and having but one cutting edge, this he plunged into the sclerotica about

half a line from the cornea, and made it traverse the *posterior* chamber of the aqueous humour, until it had reached as far over as two thirds of the iris, when he turned the edge of the instrument towards that membrane, so as to cut into it, and in withdrawing the knife to divide so much of it in a horizontal line, as to leave an artificial pupil of an oblong form, more open in the middle than at the two ends, resembling the pupil of a cat placed horizontally, instead of being, as in that animal, vertically."

The remarks of Morand naturally excited the attention of many scientific men, and from the obscurity of Cheselden's account of his own operation, several of them believed that it was but an operation for cataract done with a different instrument. This appears to have been the opinion of Voltaire,[a] Buffon,[b] Le Cat,[c] Smith,[d] and Haller,[e] but Janin thought that Morand had noticed an operation he had seen done, rather than that he alluded to Mr. Cheselden's paper in the Philosophical Transactions, and therefore performed the operation in the

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[a] Voltaire, elemens de la Philosophie de Newton. Vol 14 in 4to 1771, page 190.

[b] Buffon. Histoire Naturelle. 1 edition Vol 6.

[c] Le Cat. Traité des Sens.

[d] Smith. Treatise on Optics Vol 2 in 4to.

[e] Haller. Elementa. Physiol. Vol. 5.

following manner.—"After the usual preparations, the patient being placed opposite the light, as in the operation for cataract, and the lid elevated by an assistant, I plunged the flat and cutting edged needle of Mr. Cheselden, half a line from the edge of the cornea into the sclerotica; when it had passed in as far as two thirds of the posterior chamber, I carried the point *forwards (en avant)* through the iris, and when, about the length of a line of the needle, was visible in the anterior chamber, I prolonged the incision in withdrawing the instrument. It was not possible to see what sort of a pupil I had made, in consequence of an effusion of blood into the anterior chamber." No bad symptoms supervened, but the edges of the incision, if one was made, were found re-united when the eye was examined. In a second case operated upon in the same manner, no blood was effused, and Janin saw that he had made an incision of two thirds of the extent of the iris, although the edges of it were but little separated from each other. As the person saw, but in a confused manner, he introduced a needle and separated the edges of the incision to a greater distance, which perfectly succeeded, and the patient's vision was improved. The usual treatment was pursued, and when the eye was opened, the edges of the incision were found united.

Such was the result of Janin's operations, which induced him to reject the method altogether.

It appears to me however, that he did not perform exactly the operation Cheselden recommended, for as far as I can understand the description given by him or Morand, the knife was passed behind the iris for the distance of two thirds of its diameter, instead of before it, and the edge then turned forwards, instead of backwards.

Sharpe's account of the operation is more precise. "In doing this operation, the patient must be placed as for couching, and the eye kept open and fixed by the speculum oculi, which is absolutely necessary here, for the very reason I would discard it in the other; (cataract) since the flaccidity of the membrane from the issue of the aqueous humour, would take away its proper resistance to the knife, and make it, instead of being cut through, tear from the ligamentum ciliare; then introducing the knife in the same part of the conjunctiva, you wound in couching, insinuate it with its blade held horizontally, and the back of it towards you, between the ligamentum ciliare and circumference of the iris, into the anterior chamber of the eye, and after it is advanced to the farther side of it, make your incision quite through the membrane; and if the operation succeeds, it will upon wounding, fly open, and appear a large orifice, though not so wide as it becomes afterwards.

"The place to be opened in the iris, will be according to the nature of the disease: if the

membrane itself be only affected with a contraction, the middle part of it, which is the natural situation of the pupil, must be cut; but if there be a cataract, the incision must be made above or below the cataract, though I think it more eligible to do it above."

"The contracted iris, from a paralytick disorder, is so often complicated with an affection of the retina, that the success is very precarious in this case. This operation, by what I have seen, has answered best in adhesions of the crystalline humor, though to speak truly, but very seldom even there. As I would not mislead any one who shall practice an operation, not yet much known in the world, I do confess that either the danger of the iris separating from the ligamentum ciliare, or of the wound not enlarging sufficiently, do upon the whole, make the event very doubtful. I once performed it with tolerable success, and, a few months after, the very orifice I had made, contracted, and brought on blindness again. Since it has been discovered by the extraction of the crystalline, that a large wound may be made through the cornea without any bad consequence, I should imagine this operation would be much improved by introducing the knife perpendicularly through the cornea and iris, and cutting both at the same time, so that the incision of the iris, should be exactly in the same part, and of the same dimensions as by the other method".

From a careful consideration of these different statements, we can I think, only come to the conclusion, that Cheselden attempted several ways of operating (as he did for the stone) and that the methods described by himself, Morand, and Sharpe, were perhaps those he followed at the different periods in which each wrote, or had an opportunity of seeing him operate; and the operation Sharpe recommends, is precisely the same as the one Sir W. Adams has since revived, save, that he did not repeat his incision in the iris.

In consequence of the repeated failures of these methods, Janin proposed and performed another in the following manner. "I opened two thirds of the cornea with Baron de Wenzel's knife, and then raised the flap with a curette held in the left hand, whilst I introduced under it, a pair of curved scissors, the lower branch of which was pointed; having plunged this into the iris about a line from its inferior edge, and on the side nearest to the great or nasal angle, I directed the point of the scissors upwards about half a line to the inside of the ancient pupil, and made my section by a single stroke; the wound forming an artificial pupil in the shape of a crescent, the convex part turned towards the temple, the concave towards the nose, being in length about two lines and a half." No accident supervened, and the lady the subject of the operation, saw extremely well

with cataract spectacles for four years afterwards, while she remained under his observation.

Accident demonstrated to Janin the necessity of further varying the mode of operating. In the year 1768, a young peasant was brought to him, 17 years of age, who had been blind 7 years, in consequence of a blow. On examination, Janin found, "That the iris was imperforated, the globe natural in shape, the conjunctiva without any inflammation, the eye free from pain, and the patient capable of distinguishing light and darkness, as well as the shadows of bodies which were moved between him and the light, which decided me to attempt an artificial pupil.

"As soon as the section of the cornea was completed, I wished to make the vertical incision, and had introduced the under or sharp pointed blade of the scissors for the purpose, but on attempting to close them, I felt a resistance as if they included between them a stone, and therefore presumed that the lens was ossified. I withdrew the scissors, with the hope of being able to make the incision towards the lesser or outer angle, but on attempting it, I experienced the same resistance.

"After a little consideration, I determined to make a circular incision in the iris, which I effected with a pair of curved scissors, removing a portion of the iris which adhered to the anterior part of the capsule, and the lens which was not only opaque, but ossified in all its extent.

"I could not see at the moment, what state the artificial pupil was in, from the quantity of blood which was extravasated, as well behind as before the iris." The patient was bled several times, and little inflammation ensued; on the 40th day, however, he could not bear the light. Janin perceived that the cause of this was the too great size of the pupil, and endeavoured to remedy it, by causing his patient to use instead of a glass, a card (convex without, concave within) painted black, and having a small hole cut in the centre, of the size of the natural pupil; by the aid of which, he was enabled to use his eye with effect, in a strong light.

Gendron recommended the operation to be commenced as for cataract, and the iris to be divided with the same instrument as was used for cutting the capsule.

Guerin, with the view of preventing the closure of this newly formed pupil, which frequently took place, recommended a crucial incision to be made, and the edges or points to be removed by the scissors. But Monteggia and Scarpa affirm, that even, when this was done, the closure of the pupil was not always prevented.

Wenzel senior, recommended, that the operation should be begun as for extraction, but "when the point of the instrument has arrived at about the distance of half a line from the centre of the iris, it must be plunged into this membrane to about the depth of half a line; and, by a slight

motion of the hand backwards, it must be brought out again, about the distance of three quarters of a line from the part in which it entered. Then, pursuing the incision, as it is before described in common cases of the cataract, the section of the iris will be completed before that of the cornea, and will present a small flap nearly a line in diameter. This section of the iris, like that of the cornea, will be in the form of a semicircle. A small scissors is then to be introduced under the flap of the cornea, and the divided portion of the iris is to be cut clean off. By this method an artificial pupil will be made, which, in consequence of the sudden and equal contraction of the divided fibres, sometimes proves to be almost round, and after this operation, we may rest assured that the pupil so formed will never close again."

"It may sometimes happen, in consequence of the contraction of the fibres of the iris, that it will be difficult to perceive and cut off the divided flap of this membrane. With a little attention and dexterity, a small portion of it, however, may almost always be engaged between the points of the scissors; and this portion, whatever it be, should be removed."

Richter, and Pellier de Quingsy recommend the operation to be begun as for cataract, but instead of cutting the iris at the same time as the cornea, (which was found to be difficult and

requently impracticable, or rendering the success of the operation very doubtful) to make an incision into the centre of it with a sharp knife, of such dimensions as might be required, and through it, if necessary to extract the lens. Richter even directs that if the cornea should be leucomatous, this part should be cut, to spare if necessary, that which is transparent. Plenck advises an operation nearly similar to that of Wenzel.

Assalini states that in the year 1786, he formed the idea of performing the operation for artificial pupil, by detaching the iris from the ciliary ligament, which he had readily accomplished in various experiments on dead bodies; to effect this, he contrived a pair of forceps, of which one blade resembled Cheselden's iris knife, with a blunt point, the other limb being very fine and exquisitely sharp pointed, which was united to the knife blade by a joint, forming a pair of forceps, kept in close contact by a spring.* The apices of this instrument were dentated on the inside, so as to close most accurately by the force of the spring; so that having laid hold of the iris with this instrument, he was able to detach it with great facility, from the ciliary ligament, without lacerating it.

Accordingly, in the year 1787, he performed

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* Like Gibson's forceps.

the operation in the following manner on a young woman, blind from infancy, with two milky and capsular cataracts. " Having placed the patient in a horizontal position, I made with great ease, the incision in the cornea in both eyes; I lacerated the capsule of the crystalline lens, on which there issued a little caseous matter, and the capsule remained attached to the iris: I endeavoured to extract it, but without success, and I was obliged to have recourse to my pincers.

Having pushed the apex of this instrument into the centre of the capsule, I separated the blades and perforated it with that to which the spring was attached. I then carried on the instrument, still open, to the margin of the iris, and closed it (by liberating the spring) so as to grasp the capsule, which was firm like parchment; but by means of efforts at first gentle, and afterwards more forcible, I detached, instead of the crystalline, a third part of the iris from the ciliary ligament, thus producing an artificial pupil of an oval form and considerable extent." The operation was conducted on the right eye, in the same way, excepting that the artificial pupil was made smaller, which the operator had reason to regret, from the imperfect vision enjoyed by the patient in that eye some years afterwards.

Buzzi of Milan performed the operation for the artificial pupil in the year 1788, in the fol-

lowing manner.—On a patient remaining blind after the operation for cataract "I penetrated," says he, "into the posterior chamber with a lancet-formed needle, pushing it on through the upper part of the iris within the distance of a line of the closed pupil; after having passed the needle in a direction parallel to the anterior surface of the iris, I depressed its point, and at the same time pushing it towards the centre of the vitreous humour, I detached with some force a third part of the circumference of the iris at its superior margin:" he adds, "that great celerity is required in doing this, as the discharge of blood from the lacerated vessels of the iris fills the anterior chamber, and may not only prevent the operator from seeing what he is doing, but may even render the operation fruitless."

Forlenza of Naples makes an incision, as for the operation of cataract, of two thirds of the transparent cornea, raises up the flap, and laying hold of the iris with a delicate forceps with a double hook, draws it out, keeping it equally tense in all parts, and cuts off one third of it with a pair of fine straight scissors, after which he proceeds to extract the crystalline lens and its capsule. In a case of closed pupil combined with cataract, the iris being convex, and in contact with the surface of the cornea, he makes a puncture of a line in length, with a cataract knife, and then intro-

duces a blunt pointed needle between the iris and cornea, and by pressing it forward, and turning it in various directions, he separates the iris from the cornea, and then withdraws the needle: at the same opening he introduces a narrower knife and finishes the incision as in the case of cataract.

On other occasions, having separated the iris from the cornea with the needle, and having fixed the iris in its position with it, he introduces a cataract knife on the opposite side of the cornea, and thus divides it, as in cataract, the iris being kept back by the needle. He afterwards cuts a portion of the iris, as has been described, and extracts the lens and capsule even when transparent.

Arneman is said to have recommended the removal of a circular piece of the iris, with a pair of curved scissors, after the manner of Janin's operation above described. To effect this, one half of the cornea must be opened principally from the side, a hook introduced to gather up the portion of the iris intended to be cut out with the scissors, which should in this case be blunt pointed and straight. This method enables the operator to make a certain and central pupil; and I have seen two excellent pupils which had been made in this way by my friend Mr. Travers, and which do great credit to his dexterity. Professor Jurinne of Geneva, seems, from the report of Maunoir to

have also practised an operation of this nature; and Gleize prefers one nearly like Janin's to all others.

Demours gives his method in the following case:* "Mons. Sauvages, of Ham, in the year 1793, when twenty-two years of age, suffered from repeated and violent attacks of ophthalmia, with abscess in the cornea, which ulcerated through, so as to cause the evacuation of the aqueous humour on several occasions, and were followed by complete opacity of the cornea of the right eye, and of four fifths of that of the left. The iris of each was convex, touching the internal surface of the cornea; the anterior chamber, and the aqueous humour usually contained in it, being consequently wanting. The patient remained in this state four years, perfectly blind, when I proposed to make an artificial pupil at the upper and outer part of the eye, close to the sclerotica, where the cornea remained transparent. On the 15th of April, 1797, I plunged a cataract knife through the cornea into the iris, close to the sclerotica, taking the precaution to make the opening in the iris a little lower than that in the cornea, in order to prevent the inconvenience which might result to vision from the cicatrix. Into the opening I introduced one of the blades of a very fine pair

* Demours in the Journal de Medicine redigé par J. Sedillot, Juin, 1800.

of scissors, which penetrated a little way into the vitreous humour. The other blade was pushed between the iris and the cornea, which at this spot was only touching, but not adhering to it. I then cut off a small flap of the iris, nearly of the size of a sorrel seed, at two strokes of the scissors, and vision was immediately restored.

In his Traité des Maladies des Yeux, published in 1818, he says, " M. Sauvages continues to see very well with the eye operated on, has not had a relapse of inflammation for twenty years, and is living at Ham."

Professor Scarpa having observed, that the edge of the iris was occasionally separated from the ciliary ligament, by blows and other injuries, and that this was accomplished with less violence then would be requisite to tear the iris, leaving an artificial pupil, through which the patient frequently saw very well, conceived the following method of operating. " The patient is to be seated and secured as in the operation for extracting a cataract: then with a straight needle, such as I adopt, the sclerotica is pierced in the external angle of the eye, about two lines from the union of that membrane with the cornea. The point is next advanced, as far as the upper and internal part of the border of the iris, on the side next the nose; in this situation, close to the ciliary ligament, the

needle pierces the upper part of the internal margin of the iris, until its point is just visible in the anterior chamber of the aqueous humour. This step of the operation requires attention, because this part of the anterior chamber is very narrow, and if the point of the instrument advances even so little before the iris, it must penetrate the substance of the cornea. As soon as the needle is visible in the anterior chamber, it must be pressed upon the iris from above, downwards, from the internal, towards the external angle of the eye; as if it were intended to carry the instrument parallel to the anterior surface of the iris, in order that a portion of its border may be detached from the ciliary ligament. The point of the needle must then be depressed, in order to press it upon the inferior angle of the rent, which may be enlarged at pleasure, by drawing the iris towards the temple, and directing the instrument from before, backwards in a direction parallel to the anterior surface of that membrane, and the greater axis of the eye."

"Having produced this separation, if no opaque body appear in the bottom of the eye, the needle may be withdrawn. If however any portion of opaque capsule, which had remained after the depression or extraction of a cataract, should appear near the new pupil, this opaque portion being broken down with the point of

the needle, must be conveyed through the artificial pupil and deposited in the anterior chamber of the aqueous humour; or, as we have before shown, these membranous flakes may be left to be gradually dissolved and absorbed along with the aqueous humour which is incessantly replenished."

In the second edition of his work, published in 1818, page 368, he abandons the operation above described, for the following reasons, and recommends the one invented by Maunoir, to be hereafter noticed.

"Experience (he observes) to which all theory is subordinate, has since convinced me, that independently of the mode of operating, which I proposed, being inapplicable, of which I was aware, to the greater number of complicated cases of closure of the pupil, I was also mistaken with regard to the most material point of the operation, that is, the permanency of its success; as I have since found that the marginal pupil, or opening which is formed by the detachment of the greater circumference of the iris from the ciliary ligament, from being oval, becomes in process of time, *filiform*, and consequently useless." The principal and indeed sufficient objection to the operation of Janin.

In 1801—John A. Schmidt of Vienna, proposed two operations. In the first, he opened the cornea, and introduced a hook into the anterior

chamber with which he took hold of the iris and separated nearly one third of it from its attachment to the ciliary ligament. In the second, he introduced a needle curved at the point, through the sclerotica, and carried it behind the iris, in front of the lens, if present, or, if removed, in front of the hyaloid membrane, until it reached that part of the iris intended to be separated. The iris was then to be transfixed about the fourth part of a line from the ciliary ligament, the point of the needle appearing in the anterior chamber; and by now giving it a motion downwards and backwards, the iris, was to be separated from its attachment, to the extent which might be considered necessary.

The idea of separating the iris from the ciliary ligament, seems to have originated with Schmidt and Scarpa nearly at the same time, and without any communication with each other. The only difference between them seems to have been in the shape of the needle, Scarpa's, being less curved at the point, and narrower.

Sabatier, recommended an operation of the same nature as the Baron de Wenzel's.

Professor Maunoir of Geneva, in his first Memoir on Artificial Pupil, gives the following method. "1805—I begin by making an incision in the cornea, as much as possible on the external side, (whether there be an opacity at that part or not) about the length of three

lines, and at the distance of one line from the sclerotica. This incision should have a curvature parallel to the circumference of the cornea, and in general it will not differ from that, which should be made in the operation for cataract, except that it ought to be much less."

"I finish the operation with a pair of scissors with very thin and narrow blades," (when united, Scarpa says not thicker than a common probe) "the blades being about seven tenths of an inch long, and bent so as to form at the joint an angle of 140 degrees. The extremity of the superior blade, which is to pass between the iris and cornea, is blunt or round pointed; the inferior blade is very sharp at the point on the inside, and for a line on the back at the point, which is intended to penetrate the iris. This blade should also be a little shorter than the other."

"These scissors are to be introduced flat, until the point reaches the part of the iris where the incision ought to begin: the scissors are then to be turned, the handles raised, and the blades slightly opened, sufficient pressure being applied to force the point of the inferior or sharp blade through the iris, under which the blade is to be carried on transversely as far as the incision is intended to be made. The scissors are then to be sharply closed, and the iris will be divided."

In the first operation, in March, 1802, he

performed the single incision, which succeeded, but in the second, in July, 1802, he found it made only a division of the iris without effecting a sufficient separation for the purposes of vision. He says, in this case, "I cut about the length of a line of the external circumference of the iris, which left however a simple slit, which on withdrawing the scissors, appeared only as a black line. I reintroduced the instrument and repeated the stroke, but in a different direction, although near to the former one, so as to make a triangular incision between them; at the point of which, the two incisions met in the natural situation of the pupil, the base being at the incision in the cornea. The triangular flap thus made, retracted upon itself towards its base, so as to leave an artificial pupil near the centre, not of a triangular form, but rather assuming that of a parallelogram."

Scarpa, in the last edition of his work, adds to this account of Maunoir's operation by himself, two additional methods on the same principle, but deviating a little according to the circumstances of the case.

1st. "The contraction of the natural pupil is sometimes occasioned by the iris and pupil being stretched towards some point of the cornea. This happens in general, in consequence of prolapsus of the iris through ulcers of the cornea, or after the incision made in this membrane for the extraction of the crystalline lens. This affection is most frequently accompanied with partial

opacity of the cornea around the part occupied by the procidentia of the iris, as well as of the capsule and lens; at other times, however, these internal parts preserve their natural transparency, notwithstanding the deviation of the natural pupil. In the latter case, which is precisely that now under consideration, the pupil removed from its situation, is not in reality obliterated, but merely very much contracted, and incapable of admitting the quantity of light necessary for vision, especially if the cornea opposite to it is slightly opaque.

To remedy this morbid state, it is necessary to have the scissors of Maunoir made with the points of both blades terminating in a button. A small incision being made in the cornea at the most commodious part, according to the rules before laid down, and the scissors introduced, closed, an attempt is to be made to free the adhesion which the iris has contracted to the cornea by them; which, if it is effected, the natural pupil in general recovers its former situation and size; but, if the adhesion of the iris to the cornea is very firm, the operation is to be completed in the following manner.—One of the blades, by means of the small button, is introduced within the contracted natural pupil,* and conducted behind the posterior

* This mode of operating is equally applicable to these cases of simple contraction of the pupil, unaccompanied with prolapsus of the iris and opacity of the capsule and lens.

surface of the iris, until the other blade, defended in the same manner, has reached the confines of the cornea with the sclerotica. The iris is then to be divided in the form of the letter V, without at all injuring either the capsule or lens, both of which have preserved their transparency."

2. "Where the lens is supposed to be opaque and hard, the capsule tough and adherent to the iris, he proceeds as follows: "An incision of moderate size should be made in the cornea, either at the lower part, or a little inclined towards the nose or temple, if the partial opacity of the cornea render it necessary, and, if possible, without making use of a speculum oculi of any kind. With the sharp pointed blade of the scissors, the iris should be perforated at a small distance from its great margin, that is, nearly opposite the external wound, and pressing it further inwards, towards the longitudinal axis and bottom of the eye, than usual, at once pass it beyond the opaque capsule and the crystalline lens, if it is found there. Both the blades having reached the sides opposite to that which they entered, all the parts should be divided at one stroke, that is, the iris, the opaque capsule, and the crystalline, and without delay, after the first incision; a second should be made diverging from the first, so as to leave a large aperture in the iris in the form of the letter V. Through this large opening in

the iris, are immediately discovered the broken portions of capsule and opaque crystalline. If the portions of the lens are firm, by a slight pressure on the eye-ball, they will advance and pass through the new triangular pupil into the anterior chamber of the aqueous humour, from whence they may be extracted in the same manner as is practised in the cataract. For this purpose, where the lens is broken into fragments, a smaller incision in the cornea is requisite than where the extraction of the crystalline lens is to be made in its entire state. If, however, the crystalline is soft or caseous, the removal of the divided portions of it may be facilitated by means of the small scoop, or of the eyed forceps of Maunoir, similar to those used for the polypus, but of extreme fineness. In the same manner, with regard to the capsule, the fragments of it may be detached and extracted by means of a very fine hook, or the forceps just mentioned. The portion of capsule, which may have adhered to the small triangular flap in the iris, will form no obstacle to vision, as in consequence of its adhesion to it, it will retire with this divided portion from the apex to the base of it. Whenever the crystalline, notwithstanding the opacity of the capsule, has preserved its entire transparency, the extraction of the pieces of it will require greater attention than when it is opaque, in consequence of these portions of it

being confounded with the substance of the vitreous humour.?"

"Notwithstanding the utmost care, it is not uncommon after the operation now described is completed, and the consecutive symptoms have ceased, to find some fragments of the capsule or crystalline, or of both, concealed in the posterior chamber, appear opposite the new pupil. In this case it will be proper to introduce a fine curved needle through the sclerotic coat into the eye, and by this means completely detach the particles of capsule, if they are still adherent to the iris; and either alone or with the fragments of the crystalline, press them through the new pupil into the anterior chamber of the aqueous humour, where, being liquefied by the solvent power of this humour, they finally disappear by absorption."

Donegana, in order to render the artificial pupil formed by a separation from the ciliary ligament, more permanent, proposed to unite to it, a slight division of the transverse diameter of the iris, the result of which would be a triangular instead of an oval opening, the base being at the ciliary ligament, the apex towards the centre of the iris. For this purpose he had a curved needle made of a falciform shape, one, or the under edge being very sharp, which he used either through the sclerotica or cornea, as appeared most convenient; and after separating the iris from the ciliary liga-

ment, he effected with the cutting edge of the instrument, the proposed division of the iris. In a few instances he appears to have had some success, but those who have attempted to cut the iris in any operation, after it has separated from the ciliary ligament, know, that it is hardly possible to effect it; and that an operator will almost to a certainty, completely separate, rather than divide the iris, by a continuation of the attempts at division, after separation has commenced.

In 1811, the late Mr. Gibson of Manchester, published his methods of making an artificial pupil. The principal of which, he describes in the following words. "The first step of the operation is to secure the eye-lids as in the operation for extracting a cataract. A puncture is then to be made in the cornea, with a broad cornea knife, within a line of the sclerotica, to the extent of about three lines. All pressure is now to be removed from the eye-ball, and the cornea knife gently withdrawn. The consequence of this is, that a portion of the aqueous humour escapes, and the iris falls into contact with the opening in the cornea, and closes it like a valve. A slight pressure must now be made on the superior and nasal part of the eye-ball, with the fore and middle finger of the left hand, till at length, by an occasional and gentle increase of the pressure, or by varying its direction, the iris gradually protrudes,

so as to present a bag of the size of a large pin's head. This protruded portion must be cut off with a pair of fine curved scissors, and all pressure at the same time removed; the iris will then recede within the eye, and the portion, which has been removed, will leave an artificial pupil more or less circular."

"It sometimes happens that the whole breadth of the iris, to the border of the natural pupil, is protruded and removed in this way. This I consider as rather an advantage, because it ensures a large pupil, though generally one which is oblong in its shape. I have found, however, the mere circumstance of shape to be of little consequence in this operation, and always to be sacrificed to the object of size. It may also be remarked, that the opening has no disposition to close, when, in forming the artificial pupil, the border of the natural pupil is divided.

"It occasionally happens, also, that as soon as the knife is removed, the muscles of the eyeball act with violence, and project a small staphyloma or bag of the iris through the incision. If this bag be not large enough to form the new pupil, the iris must be further protruded by gentle pressure."

Sir Wm. Adams, in the year 1812, revived the operation of Mr. Cheselden, which had been entirely abandoned. He was induced to do so, from having effected an opening in an opaque capsule, by turning the

edge of the cataract needle backwards; from which he was encouraged to hope he might be able to cut the fibres of the iris in the same manner. Fortunately, the first case which presented itself, was very favourable for the attempt, and he succeeded in making a division of the iris exactly in its centre; "the radiated fibres immediately retracted, and formed an opening of a large size, nearly circular, and quite clear." The eye was amaurotic, and the patient was not therefore benefited. In the next case on which he operated, he perfectly succeeded, and after some alterations in the shape of the needle, he perfected his operation as I have described it in his own words,* with the exception of having made the artificial pupil too large; but which error, he has corrected in his last work on the same subject. In cases where the opacity was more considerable, he recommended the following operation, page 41; "but when there is not above a line of the circumference of the cornea remaining clear, I then introduce the knife, though in a similar manner at the external and upper part of the eye, in order to prevent the escape of the aqueous humour before the operation is completed, and make a perpendicular incision through the outer margin of the iris,

* See my observations in this work on the 1st class of diseases.

opposite to and extending the whole length of the remaining clear part of the cornea. This operation much resembles that recommended by Professor Scarpa, for artificial pupil, with this difference, that the instrument is introduced through the coats of the eye in a different part, and the fibres of the iris are divided, instead of being detached from its ciliary ligament. But if, as has happened in some of these cases, the iris separates from its ciliary attachment, my operation becomes similar to that of Scarpa. Sometimes there is only a small protrusion of the iris, which adheres afterwards to the cornea, causes the edge of the pupil to be of an irregular form, and prevents its expansion beyond the limits of the cicatrix, by which vision is either partially or wholly obscured. In this case, if the disease is uncombined with any other morbid affection of the pupil, and the cicatrix is not of a large size, the operation should consist in introducing the artificial pupil knife through the cornea, a little anterior to the iris, and carrying its point on to the adherent part, which should then be divided with the cutting edge of the instrument."

In continuation he says: "It often happens that the cicatrix in the cornea is so large as to reach beyond the utmost extent of dilatation of the pupil, even when under the influence of the belladonna. Yet, if the whole surface of the cornea is not obscured, an attempt may then

be made either to open a new aperture in the iris opposite to the remaining unobscured part, according to the plan proposed by the late Mr. Gibson of Manchester, or, to drag the natural pupil on one side. In cases of this kind, I however very much prefer the latter plan, because in the operation recommended by Mr. Gibson, the incision made in the cornea must be of such extent as probably to produce a considerable opacity in the portion of it, which still remained transparent; and this objection, which is candidly acknowledged by Mr. Gibson, page 99 of his valuable Observations upon Artificial Pupil, I saw very strongly exemplified in the case of Mr. Rushton, of Liverpool, who had been operated on by that distinguished surgeon. The artificial pupil, which was of a small size, was seated quite at the bottom of the external margin of the iris; others, which the patient informed me had been made above it, having been successively obscured by as dense an opacity, as that which originally affected the centre of the cornea; and this opacity encroached even upon that part opposite to the upper portion of the pupil still remaining. In this operation of Mr. Gibson's, it is true there is little risk of injury to the crystalline lens or its capsule; but the preservation of the lens can be of no advantage, if the inflammation occasioned by the incision made in the cornea be such as to render the whole portion of that coat

opposite to the artificial pupil, opaque. Upon the authority of Mr. Gibson's publication, I made trial of his operation in two or three instances; but the unfavourable result induced me wholly to abandon it, and to substitute for it the following operation. To this I was led by Miss Russell's case, by which it appeared to me that the original pupil might be so much dragged to one side (without any risk either to the transparent lens or its capsule) as to be made subservient to vision by a very simple operation, namely, that of making an opening in the cornea of so small a size as neither to risk opacity, or to require the removal of any part of the iris. The unavoidable diminution which (after Mr. Gibson's operation) must occur in the size of the newly formed pupil, when the natural one is much dilated, can never take place by pursuing this plan first recommended. I first fix the eye with a speculum, and then enter my closed pupil knife through the cornea about a line anterior to the iris, and make the opening somewhat longer than the width of the instrument. Through this the aqueous humour will make its escape, and be followed by a part of the iris. If the iris does not protrude sufficiently from the pressure of the speculum, to extend the edge of the natural pupil as far as the puncture in the cornea, I lay hold of it with a pair of small forceps, and gently pull it out, using great caution not to employ so much

force as to rupture it. Having in this manner dragged the outer edge of the pupil a little through the puncture, I do not cut off the protruded part, but suffer it to remain strangulated, which prevents it from again returning within the cavity of the eye. The puncture heals, and it includes the protruded part of the iris, which is shortly removed by a very weak solution of argentum nitratum dropped into the eye two or three times a day. Care should be taken to make the incision no larger than just sufficient for the iris to protrude, in order to avoid the opacity which would be likely to ensue were it of a larger size, and also to prevent the iris receding when the cornea is again distended by the regeneration of the aqueous humour."

In his last work on Artificial Pupil, published in 1819, he appears to have abandoned the operation of dragging the natural pupil to one side, and to have adopted that of Gibson, using the forceps instead of the hook, as will be noticed when on the subject of the operation by excision.

Professor Bëer of Vienna says, 1806, 1817, "The methods of operating may be classed under three principal heads.—Corotomia, Corectomia, Corodialysis."

"The first has been very properly laid aside, for a considerable time, because it is only applicable in a very few cases, and may now be fully dispensed with, in consequence of the adoption of the other two methods. Yet it

sometimes happens that the operator, instead of separating the iris from the ciliary ligament, tears it, and thus accidentally performs corotomia. Yet no expert oculist, no man well versed in the art of operating, will have the least hesitation in preferring corodialysis to corotomia, when he is perfectly at liberty to make a choice, provided corectomia is not in some measure, contra-indicated."

"Agreeably to rule, the artificial pupil should always be formed near the inner angle of the eye, in the neighbourhood of the natural pupil. Yet, frequently the operator is forced to make it towards the inferior, templar, or upper region, when the cornea is not staphylomatous; and the surgeon may, in these cases, think himself very fortunate to find a convenient place any where, on which he can operate with the requisite certainty."

"Corectomia is preferable in all cases where the lens is healthy, with the following exceptions. When the transparent part of the cornea is so circumscribed that a sufficient opening cannot be made in it to enable the operator to seize the iris with the hook or forceps, and to cut out a sufficiently large piece towards the ciliary ligament. Corectomia is also to be resorted to, when we are certain that the lymph coagulated in the posterior chamber after extraction, does not extend beyond the small ring of the iris, and is not connected with any opacity of the

remaining capsule of the lens. The former may be ascertained from the natural colour and form of the larger ring of the iris; the existence of the latter, may be suspected from the very imperfect perception of light, with respect to its particular modifications."

"The excision of the iris requires an incision at least one line in length, but which must run along the sclerotica, as near as possible to the edge of the cornea, that the operation may not be useless from subsequent opacity. In the second part of the operation, the act of excision may be attended by three different circumstances. When the iris is in no way improperly adherent to the cornea, it will be immediately protruded through the incision, by the gush of aqueous humour from the posterior chamber of the eye; of which the operator must instantly avail himself, by laying hold of the prolapsed part with a small cataract hook, and cutting it off as close as possible with a pair of Daviel's scissors; when the remaining part of the iris will immediately shrink back behind the cornea, and a well formed pupil will be evident. Or, when the iris is adherent, except at that part where the pupil is to be formed, (which may be discovered by viewing the eye laterally) the operator, after having made the incision, must introduce the small hook sideways, so as not to hook either the iris or the cornea, and then by an oblique direction of it, endea-

vour to lay hold of the pupillary edge of the iris, and drawing it out, cut it off, as before directed; by which he not only increases the size of the natural pupil, so that it now extends behind the transparent part of the cornea, but greatly augments the power of vision, because the rays of light will fall more upon the centre, and less upon the edge of the crystalline lens. Thirdly, and finally: The iris may be connected by its pupillary edge to the cornea, even at the place where the pupil is to be formed. In this case, it must be laid hold of by the hook near its larger ring, or if that tears out, a pair of fine pointed and indented forceps are to be introduced, and the iris thus torn, is to be drawn out if possible, and the piece cut off; but if it cannot be drawn out, the piece seized by the forceps must be cut off within the edge of the incision; because a perseverance in the attempt to draw the iris more forcibly out, will, tear it in all probability in a manner highly prejudicial to the success of the operation. The healthy lens and capsule can never be injured, provided the patient is steady, and the operator sufficiently dexterous. The latter method, viz. with the forceps, must at once be resorted to, when we wish to form an artificial pupil, after a previous extraction of the cataract; but this is only practicable, when the capsule is not adherent, and when there is but a small quantity of coagulable lymph in the posterior chamber, and not

then extending beyond the smaller circle of the iris, towards the ciliary ligament."

"The separation of the iris from the ciliary ligament is only indicated. First, when after an extraction or reclination of the cataract, the lymph thrown out in the posterior chamber, in consequence of inflammation, extends towards the ciliary ligament, far beyond the smaller ring of the iris, which may be ascertained with tolerable accuracy, from the alienation of the colour of the larger ring of the iris, and a somewhat imperfect perception of light. Secondly, when we have to deal with a secondary capsular, or capsulo lenticular cataract, which is adherent to the iris; or, with an opacity of the pupil, resulting from the deposition of matter or blood; and with which there is however, as is sometimes the case, a distinct perception of light, and no symptoms decidedly unfavourable to the operation. Thirdly, and finally; when the cornea is so marked by the cicatrixes of ulcers, or, is incurably opaque, and to such an extent, that it cannot properly be opened with the knife, so as to enable us to undertake the operation of excision."

"In the two first cases, in order to perform corodialysis quickly and successfully, Schmidt's lanced shaped curved needle (supposing that the pupil is to be performed towards the inner angle of the eye) is to be introduced into the anterior chamber, a good half line from the outer edge

of the cornea, the convexity of the needle being turned towards the iris. It is then to be carried without touching either the cornea or iris, to the inner edge of the cornea, when the point of it is to be pushed so deeply into the iris, within the distance of the eighth part of a line from its outer margin, that it may be firmly hooked. A double motion is then to be executed with the handle of the needle; for, the handle is to be raised, so as to press the point of the needle into the iris and vitreous humour, whilst the needle is at the same moment, to be withdrawn, but not entirely out of the eye. The point of it is now to be loosened from the iris, and the eye examined, to see whether the separated iris does not again return towards the ciliary ligament, which is unfortunately but too generally the case. If the iris shews the least disposition to return, or if the pupil thus made, be too small, the iris is to be again laid hold of with the point of the needle, at the upper or lower angle of the new pupil, and the operation of separation is to be repeated; when the artificial pupil will certainly appear, and remain as large as can be wished. But, if the coagulated albumen and lymph in the posterior chamber of the eye, really extend to the ciliary ligament, the iris may be stretched and pulled about in an incredible manner, but can never be separated; and the attempt at making

an artificial pupil will not succeed, unless by a fortunate accident, the iris and the pseudo membrane, which is behind it, should be torn asunder, and give rise in this manner to a pupil of sufficient dimensions. In the third case, Schmidt's needle must be introduced into the eye through the sclerotica, as in the reclination of the cataract, and carried on with its concave surface turned to the iris, towards that part of the ciliary ligament where the pupil is to be formed. It is then as recommended by Schmidt, to be pushed from behind, forwards, into the iris, about the eighth part of a line from the ciliary ligament, in order to lay hold of, and to separate it sufficiently by one or two attempts, which is exactly the reverse of the method recommended in the former cases. In either instance, the lens, whether transparent or adherent, will naturally be displaced at the moment of separation by the double movement of the needle, and consequently be so far out of the limits of the artificial pupil, that it can never be injurious to vision, even on its becoming opaque at a subsequent period, which will, and must inevitably be the case."

"It is now no longer to be doubted, from recent experiments made upon persons totally blind, that corodialysis performed with Reisinger's hooked forceps, has in many cases great advantages over this method; but, whether it is such as to deserve a place in this work as a pro-

totype of operative proceeding, must be decided by further experience." Since the publication of the work in 1817, from which this extract is made, Professor Bëer is said, in the third number of the Foreign Medical Journal, to have published a very interesting paper in the Austrian Medical Jahrbuch, giving an account of a number of cases in which he had successfully employed the method of Reisinger. The Jahrbuch I have not yet been able to procure.

Reisinger, in 1816, published a method of performing the operation of separating the iris, strangulating it afterwards between the edges of the cornea; to effect which, he uses a very fine double hook, which, by a slight pressure of the finger and thumb, is made to resemble a single one; and Bëer appears to have reported so favorably of it, that I have thought proper to use the author's own words in describing it.

"The operation must be begun near the outer edge of the cornea, and if possible *three* lines (one quarter of an inch) distant from that part of the iris, which is to be separated. For, if the anterior chamber of the eye be opened at a greater distance from the spot where the separation of the iris is to be effected, the iris would be loosened too largely, to form a good protrusion, the pupil would be inconvenient from its size, and the injury too considerable. If

the iris should adhere strongly, the tension will become too great in consequence of the increased distance of the prolapsed part, and it is therefore apt to be drawn back; but, on the other hand, if the incision is begun too near the spot where the separation of the iris is to be effected, a subsequent opacity of the cornea may injure the artificial pupil."

" The incision in the cornea ought to be one and a half, or, at most two lines in length, and it is important that it should not exceed that size, or the prolapsed part can not be sufficiently strangulated. A larger incision in addition to the procidentia iridis, may occasion an opacity of the cornea, which it will be very difficult, and often impossible to remove.'

"After the incision in the cornea is completed, the eye should be allowed to close for a moment to afford it rest, and prepare it for the subsequent proceedings, unless it has been previously fixed by an instrument."

" The operator should hold the hooked forceps nearly in the same manner as the cataract knife, the points of the hooks downwards, the the thumb resting on the flat side of the shank which is facing the operator, and the 1st and 2nd finger on the flat side of the opposite shank, so that the point of the 2nd middle finger may reach the end of it. The handle must rest against the *radial* side of the first joint of the first finger; the little finger serving to steady the hand.

"The instrument is now to be drawn along the edge of the cornea, pressing gently and steadily with the convexity of the united hooks against the small incision, in order that the edges of the wound may be gently opened, and the closed forceps insinuated into the anterior chamber; then glide the instrument with the convexity of the hooks against the inner surface of the cornea, as far as the spot where the iris is to be separated, taking care however, to bring the hooks as near as possible to the ciliary edge of the iris. The forceps are now to be turned, so that the points of the hooks may be directed towards the iris; then, let the instrument be opened, so that the two hooks may be at least one line, and not more than two lines asunder; press the convexity of the hooks against the ciliary ligament, sink the points into the iris, and close the forceps, at the same time gently drawing them towards you; by these motions, which must be almost simultaneous, the iris is steadily seized and easily separated. The closed forceps are now to be further drawn out of the eye, the convex edge of the hooks being carefully turned towards the inner surface of the cornea, to avoid pricking it; in this manner a considerable part of the iris will be separated, and a triangular pupil formed, of the size of at least one quarter of the iris, and which will reach the middle of the eye. Should the iris not be properly laid hold of, slip off the hooks,

or, be torn, the same movements of the instrument must be repeated."

"The handle of the forceps is now to be depressed, and, as the convexity of the hooks glides out at the upper angle of the incision, withdraw the forceps, together with that part of the iris which has been laid hold of, so as to produce a pretty considerable procidentia iridis; then, open the pincers so as to free them from the protruding part of the iris. Should the hooks, whilst withdrawing, catch in the cornea, they must be pushed back a little, and the proceeding just now detailed, gone through again; or, the convexity of the hooks may be brought out at the lower angle of the incision, by turning the instrument on its axis, and lifting the handle. The eye should now be immediately closed to assist the strangulation of the prolapsed iris, by the pressure of the eye-lid. After a few minutes the eye is to be opened, to ascertain the state of the prolapsed part; and should it have disappeared, the instrument must be reintroduced to draw out the separated part of the iris, unless the extravasation of blood should cause too much obscurity."

"If the prolapsed portion of the iris should recede, it will generally happen from the incision having been made too large. In this case, it may probably be advisable to cut off the part of the iris which has been separated, and which must again be drawn out; and so combine core-

dialysis with corectomia, to insure an artificial pupil of a proper size."

"If the regular application of the hooked forceps should not produce a perfect separation, but rather tear the substance of the iris, which can but seldom happen, and only when it is greatly altered in structure; the portion of the membrane which has been drawn out, will in all probability, be too small to remain fixed and strangulated in the wound of the cornea, and may therefore easily recede. In such a case, the pupil will be too little, and in general soon filled up by the subsequent effusion of lymph, for which reason, I here prefer the excision of the protruded part of the iris. If the larger ring of the iris should exhibit a particularly morbid and altered appearance, or if the separation have previously been attempted with the needle or single hook, and failed in consequence of tearing the membrane; it will be proper to lay hold of a broader portion of the iris with the forceps, to insure at least the removal of that part of it, although the separation from the ciliary ligament should have succeeded."

"When the combination of excision with separation of the ciliary ligament is indicated, as in the foregoing cases; and the unsteadiness of the eye renders it necessary to use an instrument to fix it; then, an able assistant, who is to elevate the upper eye-lid, must be intrusted either with

the cutting off of the protruding part of the iris, or, rather, with the task of steadying the eye, by a hook inserted in the conjunctiva scleroticæ."

"When there is considerable tension of the fibres of the iris, on account of a previous protrusion, either through an incision in, or, from a fistulous opening of the cornea, the formation of a prolapsus, may be quite dispensed with; and a separation effected to a considerable extent, by the hooked forceps, will be sufficient to form a pupil of a proper size; for, the tense fibres will recede, and cannot again lessen the pupil; we at the same time, avoid the probable danger of extending the partial opacity of the cornea, and the closure of the pupil, which the prolapsus might produce."

"When an incurable opacity extends over two thirds, or three fourths of the cornea, but at the same time leaves an anterior chamber from two to three lines distant from the ciliary edge of the iris, then, observe the rule of forming the incision in the cornea, two or three lines from that part where the iris is to be separated; and the incision may be made partly, or wholly, in the opaque part of the cornea. In this case, if, the opacity has but lately taken place, and if a general disposition to such a morbid change is strongly marked in the cornea, a combination of excision with separation appears to be indicated; for the protruded part would be apt to occasion a dangerous extension of the opacity.

"When the cornea is opaque, to within a very small distance of its edge, and is adherent to the iris as far as the transparent part, the coredialysis, agreeably to Schmidt's method, has hitherto been considered the safest operation, and excision very properly rejected, in consequence of its injuring the transparent part of the cornea too much, (even if the incision should principally extend into the sclerotica) without being able to remove the lens, which is generally opaque."

"Yet, if we consider that the very small pupil formed by Schmidt's method, even when successfully accomplished, is very apt to be obstructed on its outer edge, by the ciliary processes, which lie behind the iris and cannot be properly destroyed by the needle; and towards its inner edge by the separated iris itself, which, from its intimate adhesion to the cornea, cannot be properly removed; perhaps the following method of operating may be thought more effectual. If an opaque or transparent lens, should still exist behind the iris, I propose in the first instance, to introduce a keratonyxis needle through the cornea and iris, below the middle of the cornea, so that its convex surface may lie upon the centre of the lens, in order either to to depress it, or cut it to pieces. Then, to make an incision one half or two lines in length, with a cataract knife, through the cornea and adherent iris; to introduce the hooked forceps through this opening into the posterior cham-

ber, and lay hold of that part of the iris corresponding to the transparent part of the cornea, and draw it out of the posterior chamber of the eye, and either by tearing or cutting it off, remove it entirely: at the same time the ciliary processes will be so destroyed that their remains will certainly recede from the artificial pupil; and the injury of the iris can scarcely deserve to be taken into consideration as it will have already lost its importance in such an eye."

"Should the case require the formation of an artificial pupil on the outer side of the eye, the anterior chamber still existing within two or three lines of the ciliary edge of the iris, which is to be separated; then, my operation might be effected by using the hooked forceps over the nose, provided a prominent eye and flat nose, favored the attempt; which would also be made more easy, by the assistance of an instrument to steady the eye. But, if, this is rendered difficult bythe eye lying deep, as well as other unfavorable circumstances, particularly when the anterior chamber is too much contracted by the cohesion of the cornea and iris, the lens and capsule, being supposed to be in a healthy state; a small incision should be made in the cornea near the edge of the sclerotica, to enable the operator to lay hold of as much of the iris as possible, in order to draw it out and cut it off; but should the capsule and lens be positively

opaque, then, it is necessary to proceed in regard to the cataract, in the manner above directed; or to have recourse to the corediálysis, agreeably to Schmidt's method, with one of Himly's curved needles. If the natural pupil is in a healthy state, but covered by an incurable opacity of the cornea; or, if there is about a quarter of the cornea transparent near the outer angle of the eye, the lens and its capsule being transparent, the cornea should be opened near the edge of the sclerotica by a puncture with the knife, one line and a half in length, the outer pupillary edge of the iris drawn out without injuring the lens, or capsule, and cut off with a pair of scissors; for a prolapsus would in this case increase the opacity. By this means the new pupil will be as near as possible in the middle of the eye. If the pupillary edge should not be sufficiently visible to enable the operator to lay hold of it with safety, and without injuring the capsule, then, the operation may be undertaken, after having moderately dilated the pupil by the hyoscyamus."

"But, as long as there is sufficient space for an artificial pupil on the inner corner of the eye, that spot should invariably be chosen (cæteris paribus); for experience has shewn, that a pupil on the inner side of the eye is most favorable to vision."

"When from a previous operation, or otherwise, a softness of the ball of the eye is evident, with

a closure of the pupil, but without any other unfavorable symptoms, or such as contra-indicate the formation of a pupil, the hooked forceps will still be applicable; but only in cases where a transparent lens can be left uninjured in its proper situation, or, where we are certain of being able to close the small wound in the cornea immediately, by the artificial prolapsus of the iris. In every other case, it will be advisable to attempt the coredialysis, agreeably to Schmidt's method, in order to avoid a considerable and very injurious loss of the vitreous humour, which cannot be so great through a puncture of the sclerotica. Yet the more important *lesion* of the sclerotica, choroidea, &c. together with the morbid state of the eye, and its liability to injury, ought previously to be well considered."

"When the lens and its capsule are in a healthy state, great care must be taken in using the hooked forceps, that the convexity of the little hooks may not be removed from the interior surface of the cornea, in introducing, or withdrawing the instrument; and equal attention must be paid in laying hold of the iris, to avoid a lesion of the lens or its capsule, and the danger of a cataract, which would be the consequence; and should a subsequent opacity of the capsule or lens take place, this cataract must be put aside, either, by reclination per scleroticum (and the more easily as from the size of the arti-

ficial pupil the operation of the needle is visible) or depressed, or destroyed by the keratonyxis; for, pressure on the pupillary edge of the new immoveable pupil, or, on the iris, which has lost its original value, cannot be attended by any essentially bad consequences."

"When an opacity of the capsule or lens exists, many difficulties may occur, which must be met by means equally diversified. If we find a cataract where the natural pupil is obscured by an opacity of the cornea, and if no adhesion of any consequence, of the capsule with the iris, is discovered by the external, and strong application of the belladonna; a keratonyxis needle should be introduced through the cornea, in the usual manner, into the middle of the pupil, (pressure on the lower pupillary edge is here to be disregarded) and the cataract depressed or destroyed. If the artificial pupil is to be formed on the inner side of the eye, let the small incision in the cornea be now made, which may include the previous opening of the needle; then, with the hooked forceps separate the iris from the ciliary ligament, and cut off the protruded part of it with the scissors. But, when the artificial pupil must be formed on the outer side of the eye, then the separation and excision, effected with the hooked forceps as described page 52, are to be resorted to. Perhaps it might be more advan-

tageous to undertake the keratonyxis, and the excision of the iris, at two distinct periods, by which the eye would be spared; but, if the opacity of the cornea has lately taken place, or, if we perceive an evident disposition in it to enlarge after a fresh lesion, then, an attempt at corediálysis, agreeably to Schmidt's method, either on the inner or outer side of the eye, would be preferable. Should we find the capsule diseased, and adhering to the pupillary edge of the iris or uvea, which may be discovered by the application of the belladonna; then, reclination through the sclerotica, or Schmidt's corediálysis will afford the best prospects of success; should the attempt fail, the hooked forceps may be tried, as the cataract has at least been dislodged."

"When the lens and capsule, or even the pseudo-membrane of a lymphatic cataract, is so adherent to the pupillary edge of the iris, that the visible surface of the cataract has a diameter of at least one line, there is reason to hope that the natural pupil may be restored. A moderately bent depressing needle should be introduced through the sclerotica, and moved as in reclination; when the central piece of the capsule, or the pseudo-membrane will in general be separated from the pupil to which it adhered; but, should this fail, which will chiefly happen in cases of fluid-cataract, where the capsule has grown into the pupil,

then endeavour to push the point of the needle (the convexity turned backwards) at the outer edge of the pupil, through the capsule, into the anterior chamber of the eye; turn the needle on its axis, in order to sink the point at the inner pupillary edge into the posterior chamber of the eye, and thus hook round the cataract, or lymphatic concrement by a movement towards reclination, by which this substance is frequently separated from the pupil. If this operation succeed, the belladonna should be immediately applied, to prevent the bad consequences of an iritis. Should this attempt at restoring the natural pupil fail, carry the point of the needle (which is already in the anterior chamber of the eye) as far as the ciliary edge of the iris, press it into this membrane, and endeavour to effect its separation, by moving the point of the needle backwards and downwards; should the object not be attained, even by these means, the hooked forceps must be employed, (after the reaction has subsided) for the lens will already have been depressed, and will be ultimately absorbed. In every other kind of cohesion of the pupil with the capsule, or with coagulated lymph, the attempt at restoring the natural pupil is contra-indicated."

"When we are fully convinced that a capsular or lenticular cataract exists behind a pupil which is completely closed, and appearances

indicate the application of the hooked forceps, make the incision in the cornea in its proper place, introduce a keratonyxis-needle through it, and perforate the iris, so that the convex surface of the needle may be directed backwards; then depress the lens, withdraw the needle, and by means of the hooked forceps form the artificial pupil. The lens and its posterior capsular membrane, will either be depressed, or cut in pieces, and the anterior capsule, which in such cases, is generally intimately connected with the uvea, will be removed together with the iris, by the forceps. The wounding of the iris is a matter of minor consideration in the formation of artificial pupils, and the injury it sustains from the needle, will be but inconsiderable; therefore this operation is preferable to reclination through the sclerotica, which is apt to occasion much more important lesions, the operation of which, under these circumstances, is very uncertain. But if the existence of a cataract connected with an opacity of the pupil, is not ascertained, which it is often difficult to do, nothing should be undertaken against the lens or capsule, for fear of injuring them, if they should be in a healthy state; and the operation ought to be confined to the formation of a pupil by the hooked forceps: it is even to be hoped that a cataract adhering to the uvea, may be drawn

aside with the iris, by their operation, and that when a lasting connection of the iris with the cornea has been effected, by means of a prolapsus, the cataract adhering to the iris, will never be able to resume its former place, and injure the new pupil. If, however, after the formation of the pupil, there should be a cataract preventing vision, or should the lens subsequently become opaque, it will be easier, to remove the cataract, after the irritation occasioned by the operation, has completely subsided; for by means of the vicarious pupil, the operator will see what he is about. If the artificial pupil is sufficiently large, the keratonyxis may be undertaken with advantage. But, should the pupil be small, or the cataract adhering to the iris, it will be proper to prefer depressing through the sclerotica, in order to render the operation more certain, and to avoid the possibility of the opacity of the cornea covering the small pupil."

Professor Himly, that he might render the operation of separating the iris from the ciliary ligament, practicable, in such cases in which it had hitherto appeared inadmissable, improved upon it, in the following manner.

1. When only a small portion of the cornea remained transparent at the external angle of the eye, but still admitting of the formation

of an artificial pupil behind it; he invented a needle, which by being bent so as to receive the nose in the curvature, might be used over it; and entered at the inner angle of the eye, thereby avoiding all injury to the transparent part of the cornea.

2. When the cornea is nearly or altogether transparent, he uses a needle which as far as regards the point, holds a middle place between those of Schmidt and Scarpa. This is introduced through the cornea into the anterior chamber, until it reaches the ciliary edge of the iris, into which the point is pressed, and the iris separated in the usual manner.

3. When the structure and situation of the iris is altered, so that it becomes convex, and nearly in contact with the cornea, the point of the needle is very likely, when pushed through it from the posterior chamber, to puncture the cornea. To avoid this, he directs the needle to be passed through the sclerotica at the external angle, and the point made to perforate the iris immediately at its attachment to the ciliary ligament, when, by insinuating the instrument sideways, between the iris and the cornea, room may be gained to complete the operation.

4. When the iris is so completely in contact with the cornea, that the point of the instrument cannot pierce it without wounding the cornea, he performs an operation at two different periods, leaving a proper interval between them. First,

he removes the lens by depression, by which a sufficient opening is made in the natural place of the pupil, to allow the aqueous humour to pass into the anterior chamber, and press back the iris into his proper situation; which being accomplished, he effects in the second instance, the operation of separation. (Coredialysis.)

Buckhorn, Richerand, Flajani, and others, have given their sanction to the anterior operation, as described under the second head; but I have reason to believe, that Professor Himly did not find it generally answer his expectations, for, the pupil closed after a certain lapse of time; and he now performs the operation of separation of the iris from the ciliary ligament, from behind, having passed the needle through the sclerotica; or, after the method of Langenbeck, through the cornea, strangulating a portion of the iris between the edges of the incision, to prevent a closure of the pupil. Himly has also recommended the operation of drawing the natural pupil to one side with a hook, strangulating the iris, in the same manner as has been recommended by Sir W. Adams, although he has not acknowledged his authority.

Flajani is said, by Scarpa, to have made an artificial pupil by dividing the iris crucially with a double edged needle, introduced through the cornea, which he presumes to have been perfectly transparent, and unaccompanied with opacity of the lens or capsule. But Scarpa,

disapproves of the operation, and very properly remarks, that when the needle is introduced into the anterior chamber of the aqueous humour, and has perforated the upper part of the iris, a vertical division of this membrane can only be made by pressing the instrument from above, downwards, and withdrawing it at the same time from the eye; in consequence of which, the iris is carried forwards by the pressure of the needle towards the concavity of the cornea. In the second stage of the operation, or, in making the transverse incision in it, as the aqueous humour is almost entirely discharged, it is very difficult to replace the sharp and pointed needle a second time in the anterior chamber, where the iris is nearly in contact with the cornea; and still less after this is accomplished, can the instrument be moved in a transverse direction, so as to divide this membrane crucially, through its whole diameter.

Professor Walther, late of Landshut, 1815, opens the cornea for about two and a half lines, with a small cataract knife, either in a straight, or in an oblique direction from the transverse diameter of the cornea, downwards or upwards, as the case may require. Through this opening the iris protrudes, if it be not too strongly attached. If it should not protrude, but lie against the wound, he seizes it with a pair of forceps, and cuts it off.

The advantage, or peculiarity of Walther's method, is, that of making a large opening.

He also practices in some instances, the operation of separation to which he seems particularly to have been led from a consideration of the following case. A patient came to him with a leucomatous affection of the cornea, preventing vision, to which was superadded, inflammation of the internal parts of eye, and an effusion of lymph, for the evacuation of which, an opening in the cornea became necessary. Through this opening the iris protruded, and drew the pupil opposite to a transparent part of the cornea, through which the patient immediately saw. He allowed the iris to remain protruded, and in this way a cure of both complaints was effected.

Langenbeck, in a memoir in his new Bibliothek für die Chirurgie, 1st. volume, 3d and 4th part, sec. 2, p. 676, notices the formation of an artificial pupil, and has also invented an instrument for effecting the separation of the iris. It consists of a silver tube, having a very small gold one affixed at one end, into which is inserted a small hook, which is moved backwards and forwards by a spring in the silver tube, but confining the motion of the hook to two lines. A very small opening is to be made in the cornea, in order that the iris, when brought out, may not recede. The hook inclosed in the golden tube, (to prevent its bending from

its tenuity,) is to be directed to the spot where the iris is to be laid hold of; the hook is then to be pushed out by the spring, to the extent of one line, which will be sufficient to enable it to penetrate the iris. As soon as the hook is affixed, it is to be allowed to recede to its usual place in the golden tube, drawing with it, the iris, which will be caught between it and the end of the tube, something in the manner of a pair of forceps. As soon as the hook begins to recede, a small black spot will be seen at the edge of the iris, from its incipient separation; and care should be taken to insert the hook at, or even under the edge of the sclerotica,* and as near as possible to the ciliary processes. The hook must recede gradually, the finger being kept steadily on, and moved slowly with the knob, regulating the spring in the silver tube. As the chance of tearing off a part of the iris, is proportionate to the distance it has to be drawn out, the opening is to be made as near as possible to the spot where the separation is to be effected, taking care that the pupil shall be large enough, so that the prolapsed iris, and subsequent opacity of the cornea, cannot obstruct the entrance of the rays of light. The great advantage of this instrument,

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* The iris, before it is attached to the ciliary ligament, extends a little farther outwards than can be seen through the cornea, G.

in Langenbeck's opinion, is, that the separation is effected by means of the spring, which is more gentle and gradual, than when accomplished by the finger alone, so that if a commencement of the separation can be obtained, the completion of it is certain, without any risk of tearing the iris. As soon as the hook has receded to the golden tube, carrying with it the iris, the whole instrument is to be gently withdrawn, moving it slowly up and down, in order to loosen the upper and lower attachment of the iris; for this membrane may be torn, if there has been much previous inflammation, or if direct force be employed in withdrawing it. The instrument always keeps its hold as firmly as the best forceps, and with much more advantage, for it occupies less space, and enables the operator to make the incision in the cornea small, on which the correct strangulation of the iris depends. In all his operations, the capsule of the lens has never been injured by this instrument, which he considers another advantage, and he conceives that it may be used through the sclerotica, without rendering the lens opaque, as by the methods of Scarpa and Schmidt. He thinks it a better instrument than that of Reisinger, because there is much less risk of injuring the lens, from the hook being smaller; and also, because it may be held much steadier, from its acting in conjunction with the golden tube, like a forceps: and as it

is not necessary to introduce it so deeply as the hooked forceps, it is therefore less likely to injure the lens.

When the cornea is only transparent at the outer edge, he sometimes performs excision. When there is an opacity of the cornea opposite the natural pupil, he has proceeded as follows. The cornea being opened near the edge of the sclerotica, the iris protruded, which protrusion being laid hold of with the hook, he drew out the pupillary edge, and strangulated it, but the iris again receded on the patient's moving his eye, which rendered it necessary to repeat the operation. If the iris will not protrude in such cases, the hook must be introduced, to lay hold of the pupillary edge, and to draw it out; and Langenbeck thinks there is more danger of inflammation and effusion of lymph, and subsequent closure of the pupil, after excision, than after strangulation, which is his reason for preferring it.* He thinks this operation ought to supersede that of excision, in every case in which the natural pupil remains, but is diminished in consequence of some adhesion to, or, of opacity of the cornea, preventing the passage of the rays of light.

Professor Langenbeck formerly directed the

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* This is found to be an erroneous opinion. G.

operation to be done without strangulating a portion of the iris in the wound of the cornea, in which he was supported by Bonzel of Rotterdam, who recommends it to be done in the same manner, first fixing the eye by means of a hook in the conjunctiva; but, from finding that the artificial pupil thus made, frequently closed again, he has latterly performed it as above described.

Frattini of Parma, 1816, considers coredialysis through the anterior chamber, as preferable to all the operations hitherto proposed, but recommends it to be done in the following manner.— "After having opened the cornea, the handle of the needle is to be a little depressed, so that the point may be kept clear of the iris, and by carefully insinuating it in this manner, alternately raising and depressing the handle, it is to be carried on to within about a line from the greater circumference of the iris, either at its superior or inferior part. The point of the needle is then to be pushed into the iris, just as far as will be necessary to enable the operator to detach it from the ciliary ligament, not by drawing the iris outwards, but by gently moving the instrument from above, downwards, and vice versa, until the object be accomplished.

Gräefe of Berlin, who also considers coredialysis to be the preferable operation, performs it however with an instrument of his own invention, a fine double hook, provided with a sliding sheath

steadied by a ring, and so constructed, that it will slide forwards or backwards, exposing or sheathing the point of the instrument at pleasure. The cornea being opened, the sheathed instrument, which he calls a coreoncion, is to be introduced flat, the point directed downwards, and carefully carried on by gentle motions, until it reaches that part of the ciliary margin of the iris which he intends to separate. The sheath is then to be slid back, the double hook exposed, and pressed into the iris, when the sheath is to be again advanced, leaving the double hook to grasp the iris and ciliary processes in the same manner as a forceps; he then separates them from their attachment, by gently drawing the instrument outwards, by repeated efforts. *Jüngken wishes to divide the merit of this mode of operating between Langenbeck and Gräefe; but Langenbeck says Jüngken saw him do it long before Gräefe; and Langenbeck's is certainly the better instrument.

Wagner, in an inaugural thesis, published at Göttingen in the year 1818, from which I have derived much useful information, describes an invention of his own, which he has used frequently with success on animals and on dead bodies, although never on man; but which I

* Vide das Coreoncion ein Beitrag zur Künstlichen Pupillenbildung, von Ch. Jüngken. Berlin, 1817, in Commission bey Liebeskind. Additional account in Langenbeck, Neue Bibliothek, 2 Band, 1 Stuck, part 3.

think complex, and therefore objectionable. It acts much like the instrument of Gräefe, being a double curved needle so constructed as when closed, to resemble a single one. It is to be introduced closed, through the cornea; and when it has reached that part of the iris to be separated, it is allowed to open to a certain distance, which has been adjusted before hand by a spring and screw; it is then to be pressed open into the iris, and again closed, so that a portion of the iris is included between the needles, as by the double hook, when the separation is to be performed as usual. He thinks the lens should always be first removed by depression, when the operation is performed through the sclerotica, the point of the instrument being subsequently directed forwards through the iris, instead of backwards, to effect the necessary separation.

Dr. Embden, 1818, says, these operations, through the cornea, ought not always to be resorted to, although most authors have approved of them; and recommends an operation through the sclerotica, with an instrument of his own invention, called * Raphiancistrum, from ραφιον (acus) et ἄγκιστρον (hamulus). In cases where the opacity of the cornea, and the adhesion of the iris to it, is so great, that the more usual modes are not sufficient; the instrument is to be introduced at the distance of a line

* Vide Plate 2.

from the cornea into the sclerotica, so that one side is upwards, the other downwards. On the left eye, the hook side upwards, on the right eye the hook side downwards; and, to facilitate the introduction of the hook, the instrument must be pressed in the opposite direction. After the instrument is introduced, the lens is to be depressed, and the hook advanced one line beyond the point of the needle, by means of the knob in the handle; the ciliary edge of the iris near the inner angle is to be hooked with it, and drawn into the wound of the sclerotica, the handle of the instrument being first carried towards the temple, until the point of the needle appears in the wound, when it is to be directed towards the nose, and the hook brought out of the wound with the iris attached to it. Dr. Embden thinks this mode of operating through the sclerotica, as effectual as Langenbeck's through the cornea.

Professor Dzondi, of Halle, performs the separation of the iris by means of an instrument in the shape of a forceps. The blades are a little bent towards their points, the one broad, grooved and rounded off, the other pointed, not rounded but flat on the inner side, grooved, and a little shorter than the other, so that when the forceps is closed, the point projects. The pointed blade is to be thrust through the iris, and by closing the forceps, that membrane is grasped. (Langenbeck.)

Professor Zengs, of Vienna, says, "many recent attempts made by Dr. P. Jäger, have proved that the membrane of the iris may be separated from the ciliary ligament by a single hook, properly introduced, with greater facility than by the double hook of Reisinger, &c. In all my attempts to introduce any instrument in the shape of forceps, into the anterior chamber, in order to separate the iris, experience has taught me that the anterior chamber is frequently too small, and the iris too near the cornea to admit of the operation being performed with such an instrument. However M. Reisinger's invention will do him great honour, and may be applicable in certain cases."

Schlagintweit of Munich, 1818, has also invented an instrument for the separation of the iris, which he terms an *Iriankistron, which he uses in the following manner. After making an opening in the cornea, less than a line in length, the operator takes the iriankistron with the point downwards, the fore finger on the knob of the silver ring, and introduces it closed into the anterior chamber of the eye, carrying it on towards the inner edge of the cornea. He then, by a gentle pressure on the knob of the ring, draws back the forceps blade; and presses the hook still further into the eye. The handle is then to be turned a quarter of a turn, so that the point of the hook

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* Vide Plate 2.

may be directed to the iris, when by a gentle effort, it is to be fixed into it. The forceps blade is now to be pushed forwards again, and the iris thereby pressed into the hollow of the hook. The instrument is now to be withdrawn with a gentle rotatory motion, by which the iris will be gradually separated, and drawn into the opening in the cornea. A sufficient prolapsus iridis being thus obtained, the operator opens his instrument, raising the handle at the same time towards the temple, when he again depresses it obliquely, and disentangles the hook.

The inventor had not, tried his instrument on a living subject, at the time he wrote, but says he always succeeded with it on dead bodies, and on animals.

Faure, 1814, invented an instrument, not for the separation, but for the division of the iris, being a very sharp pair of scissors, acting by a spring, whilst the extent of the opening is regulated by a screw. The cornea being opened, the scissors are introduced, closed; and, on being opened, one branch is passed through the iris, and in this manner a sufficient opening is made without injuring the lens, which in certain cases may be readily accomplished.

Montain, 1817, invented two instruments, one a pair of scissors, the other a knife, both to be used through the cornea, but neither possessing any peculiar advantages.

Muter, in 1811, published the following method of operating. "The border of the iris towards the external angle of the eye, is the most convenient part to be operated upon; and we shall at present suppose this to be the situation in which the artificial pupil is to be formed. In this operation, the eye must be steadily fixed, the greatest precision being necessary."

"The operator taking a very fine thin couching needle, pierces the sclerotica immediately behind its junction with the cornea, in the line of its transverse diameter, the point of the needle should barely puncture the inner coat of the eye, lest it wound the capsule of the crystalline. The needle should be entered, as if it were the intention of the operator to push the margin of the iris off from the ciliary processes. The sclerotica being thus punctured, the couching needle is to be laid aside, for the iris scissors, which are so constructed that the blades, when open to the distance of about half a line, are parallel to each other, to the extent of four lines."

"The point of one blade is rounded off and blunt, the point of the other is sharp and thin, similar to a spear-pointed couching needle. They open by a spring, and like the forceps, have only one long handle. The blunt pointed blade is to be entered into the puncture of the sclerotica, the other blade will be opposite the

margin of the cornea, through which it is to be pierced. The points of both blades being then directed forwards, till opposite the margin of the pupil, the border of the iris will be included between them. The points should now be turned towards the lower margin of the pupil, and closed, by pressure with the fore finger on the short handle; an incision of the whole breadth of the border of the iris, beginning in the line of its transverse diameter, and extending to the lower margin of the pupil, will thus be made. The points being now allowed to be opened by the spring, are to be next turned towards the superior margin of the pupil, and again closed; another incision of the whole breadth of the border of the iris will be made, beginning in the line of its transverse diameter, and extending to the superior margin of the pupil."

"Thus will a triangular portion of the exterior border of the iris be removed. The scissors being withdrawn, the small hook is to be introduced, and the divided portion extracted through the incision."

"During this operation, the aqueous humour will not be evacuated until the scissors are withdrawn, consequently they can be used with the greatest precision, the parts of the eye retaining their natural tension and situation."

"The incision thus made will not exceed two lines in extent; and, if proper care be taken in

piercing the cornea, and in closing the scissors, it will not be in the least ragged, but the lips clean and smooth cut. Although a portion of the exterior border of the iris is most conveniently removed, yet the superior, or inferior border may also be removed in a similar manner. The incision will be sufficiently large to permit the extraction of the divided portion of the iris, and as it extends but very little way into the cornea, not more than a line, cannot be the cause of any cicatrix to obscure the artificial pupil."

Dr. Ryan, of Kilkenny, 1818, has no operation peculiar to himself, but appears to perform either that of Mr. Gibson, or of Mr. Cheselden, improved by Sir W. Adams, as the case may require. In adopting these methods, he does not blindly follow the opinions of their inventors, but thinks and acts for himself, in a manner which the favorable result of his cases shews to be highly creditable. The following passage is a good epitome of both.— "Many reasons have been assigned for the frequent failure of the operation, but the chief cause has probably been overlooked. According to my view of the matter, disappointment has arisen chiefly from our not having adapted the most appropriate operation to each particular case: nothing can tend to counteract our endeavours more completely than a prepossession in favour of any one mode of operation,

or an adherence to the rules laid down by any writer, however high his reputation. For example, I cannot coincide with Sir W. Adams, in the view which he has taken of the cause of the failure of Cheselden's operation, which he has of late revived. His method of introducing the knife, or the double edged needle, (for it appears to me a matter of indifference to which the preference is given) is unquestionably a great improvement:* but I have never found it necessary to place any portion of the lens, or its capsule, between the edges of the newly-formed pupil. I cannot discover any advantage in this step; and from analogy, I am led to consider these parts as extraneous substances, which would be likely to produce inconvenience when fixed between the edges of the newly-formed pupil. Indeed this operation is not that which is most generally applicable; it is not only ill adapted to the cases for which he recommends it, but would be highly injurious in many of them."

Professor Quadri of Naples, has performed this operation in twenty-two instances, in the clinical school of surgery of that city, in the year 1816, on persons of every temperament, whether scrophulous, scorbutic or syphilitic, between the ages of 17 and 55, and at every sea-

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* Dr. Ryan seems to have forgotten, that it is Mr. Sharpe's method; see in page 11, the quotation from his work.

son of the year. In fifteen cases the operation was attended with success; with great relief in six; and failed totally but in one, from amaurosis. He frequently dilated and enlarged the remaining vestige of the natural pupil, contracted in some cases nearly to obliteration. He performed the operation on seven persons, on both eyes at the same time. He makes the aperture, of the dimensions of from one to two square lines. When the state of the cornea leaves choice to the operator, he prefers the inner portion of the eye to the outer, as affording greater benefit to the patient; and he makes the pupil a little below a line drawn horizontally through the centre of the eye.

PRELIMINARY OBSERVATIONS

AND

CLASSIFICATION.

THE object of the Formation of an Artificial Pupil is to admit the rays of light to the retina, with as little injury as possible to the remaining parts of the eye. To effect this, an opening must be made in the iris, of an extent equal at least to the natural size of the pupil, when moderately dilated; for if it be less, there will not be sufficient room for the rays of light to act with effect on the retina, in a moderate light, and it must not be forgotten that the artificial pupil never acquires the motions of dilatation and contraction, so eminently useful in the natural one. It should not, on the other hand, be too large, because it would prove detrimental to vision, by admitting too many rays of light to the retina.* It should resemble the natural opening in form, as nearly as possible, for there cannot be a doubt of the advantage derived in man from a circular pupil, where the axis of

* When the pupil is too large, it seems to have the same effect of confusing vision, as in the disease termed Mydriasis, which is an unnatural dilatation of the pupil. In both cases the patient's vision is much improved by looking through a small hole in a card or glass.

vision is directly forwards; and although an artificial one is seldom made in a circular form, and in the centre of the iris, still that process will be the best, the result of which most nearly resembles the natural state.

When an artificial pupil cannot be made in the centre of the iris, (from whatever cause) the other parts of it are eligible in the following order. 1st. The inferior part of the iris inclining inwards: 2nd. The internal, a little below the transverse diameter of the eye: 3rd. The inferior and external. The upper part being the least eligible, from the eye-lid covering that portion of the cornea in the natural state of the eye. The lower and inferior parts of the iris are to be preferred, for the following reasons; because the line of vision being through that part, the eye is less removed from its natural axis, and consequently less squinting is occasioned than when vision is performed in any other direction; and, if both eyes are operated upon, the axes of vision are made more nearly parallel; and a decided preference of a position, not higher than the centre of the iris, is founded upon the natural position of by far the greater number of objects of vision, which it is essential for a person to see, being viewed forwards or downwards. In general, however, the selection of the place, in which the iris is to be perforated, depends more on the transparency of the cornea, than upon the choice of the operator.

It may be useful to remark, that a small artificial pupil at the lower part, is infinitely more valuable than a large one at any other, which in the natural state of the eye, is covered by the lid, or much out of the axis of vision. If the pupil be made quite on the nasal side of the eye, the field of vision is less extensive in proportion as it is distant from the inferior margin of the cornea; and, although this objection cannot be urged against the pupil made towards the temporal side, still there is a defect frequently observed, if the pupil be small, and near the ciliary margin of the iris, from the patient's turning the eye a little inwards, to allow the rays of light to fall more on the central part of the retina; and this is even accompanied, in some instances, by a corresponding motion of the head, when the person is desirous of submitting any thing to an accurate inspection.

If the state of the cornea will permit of it, a sound part of the iris should be selected in preference to that which is apparently unhealthy; for the iris, when sound, seldom bleeds, and it is not liable to inflammation when injured, or divided with a cutting instrument; in its natural condition, indeed, it has but little sensibility, and is therefore not very susceptible of pain, but with an unhealthy iris, we find the reverse to be the case; when wounded, it bleeds copiously, is prone to inflamma-

tion, which terminates not unfrequently in suppuration, or the deposition of lymph: and it is manifest, that the occurrence of either, may eventually destroy the eye, or render the operation unavailing, by filling up the aperture made to serve as a pupil, with a deposition of lymph, or, even by the formation of an adventitious membrane behind it.

The central part of the iris frequently appears unsound, whilst it is more healthy at its outer or inner margin, in which case one of these places should be selected for the operation, notwithstanding the rule which has been stated.

The external and internal margins of the iris, immediately on a line with the transverse diameter, or equator of the eye, are particularly unfavorable for the operation of separating the iris from the ciliary ligament, (Coredialysis.) on account of the long ciliary arteries entering at these parts, and causing by their division, a greater hæmorrhage, and frequently a higher degree of inflammation than would otherwise occur; which dangers are augmented by the more firm attachment of the iris at this part, and the greater force necessarily employed for its separation.

The operation for artificial pupil should not be recommended where one eye is sound; for, as the axis, as well as the power of vision will be different, it is likely in most instances, to be

prejudicial rather than serviceable ; and especially if the lens be in any way implicated, for, it will confuse the sight of the sound eye, and by making the patient squint, give rise to greater personal deformity and inconvenience, than it was intended to rectify. If the lens and capsule be perfectly transparent, and the pupil can be made at the inferior and internal part of the iris, observing an axis parallel to that of the sound eye, no inconvenience may perhaps ensue, as has frequently been observed to be the case, where the pupil has been drawn a little to one side, in consequence of a slight attachment of the iris to the cornea. But an exception of this kind does not invalidate the general rule, of not operforming an operation on one eye, whilst the other remains entire.

It is a question of some moment, to decide whether the operation ought to be performed, or not, in those cases, wherein vision has been totally lost in one eye, and materially impaired in the other; and the decision ought to rest with the patient, rather than with the surgeon, even where the prognosis is favorable; for, if the patient still enjoys sufficient power of vision to enable him to guide himself, the surgeon would be more than hardy, who could put that portion of the faculty of sight in jeopardy, by attempting an operation which may fail in the best hands. In such circumstances the opera-

tion should not be attempted upon any grounds, unless the case is so simple as to require only an opening in the cornea, and the removal of a portion of the iris for the purpose of enlarging the natural pupil. If the patient cannot see sufficiently well to guide himself, the conditions are very essentially altered: since an unsuccessful operation involves the loss of very little, whereas much is to be gained by the successful issue of it. Where opacities in the centre of the cornea occasion the impediment to vision, it is prudent to dilate the pupil beyond the edge of the opacity, by the daily application of the belladonna, which may possibly enlarge the sphere of vision, so as to supersede, in a doubtful or dangerous case, the necessity of an operation.

I am perfectly aware that in many cases of this kind, an operation may be followed by the most brilliant success; but it is not to be denied, that total blindness has been produced by this operation, in many instances; simple, therefore, as it may appear, it ought not to be practised without the free concurrence of the patient, unbiassed by the language of authority, founded solely upon a fair and true statement of all he has to hope for, or to apprehend from its consequences.

The artificial pupil, as I have already stated, ought to be made as near as possible in the centre of the iris, in order that the rays of light

may impinge upon the retina, after passing through the crystalline lens, as in the sound state of the eye. It is also necessary, on account of the ciliary processes, which are opaque bodies, surrounding the capsule of the lens, lying on, and attached to the zona ciliaris, and situated immediately behind the greater, or outer margin of the iris. If then the opening in the iris be small, and directly in front of these processes, the patient ought not to be able to see, except they become transparent, or have been removed by nature or by art. Scarpa* says.—"All who are acquainted with the structure of the eye, know that the corpus ciliare, with its processes, is prolonged from the ciliary ligament, to the circumference of the capsule of the crystalline lens, behind the great margin of the iris, extending to about a fourth of the length of the semi-diameter of this membrane, from the ciliary ligament, towards the centre of the iris ; every artificial pupil, therefore, which is not made at such a distance from the great margin of the iris, and consequently from the corpus ciliare, that the apex, at least of the triangular aperture, (Maunoir's operation) may correspond directly to the circumference, which would have been occupied by the capsule of the

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* Page 382, 2nd. edition, by Briggs.

crystalline, must be useless. The facts which are cited of a contrary kind, as that published by Demours, prove only that, by a rare union of favorable circumstances, an operation, the least rational and methodical, may be successful in the result, but can never serve as a general rule."

This anatomical statement is not disputed by any person that I am acquainted with, and is acknowledged in its fullest extent by many. Yet the opinion deduced from it, is not sufficiently confirmed; for the ciliary processes do not oppose such an obstacle as Scarpa is disposed to believe. Of the structure and function of the corpus ciliare, much is yet to be learned, both as to a state of health and of disease; and many things occur in practice in relation to it, which are difficult of explanation. In the instance in question, the ciliary processes do not oppose the entrance of light in the manner attributed to them by Scarpa, and in many cases in which vision has been good, they have not been removed with the excised portion of the iris. In others, I admit they may have been cut out; but I do not believe it to be a common occurrence. From a careful consideration of these circumstances, I am induced to conclude, that the ciliary processes, although sometimes removed, do in general retract, or withdraw themselves from their attachment to the zona ciliaris, towards the ligamentum cili-

are; in consequence either of the injury the iris has received at its junction with the ciliary ligament, or, from their being incapable of bearing the stimulus of light, or, from some cause with which I am unacquainted. It must not, however, be overlooked, that in cases where a partial separation of the iris takes place from a blow, or from the attempt at dividing the centre of the iris with a knife, the restoration of vision, through the artificial pupil thus accidentally made, does not generally follow.

CLASSIFICATION

Of the States of the Eye, requiring the Operation for the formation of an Artificial Pupil.

The morbid affections of the eye, which render it expedient to perform an operation, in order to produce an artificial pupil, for the transmission of the rays of light to the retina, though many and various, may nevertheless, for the sake of arrangement, be comprehended under three general classes, namely—

1st. Those morbid states of the eye which depend on derangement of the structure and function of the iris, or, of the crystalline lens and its capsule, the anterior chamber of the aqueous humour preserving its natural dimensions, the central part of the cornea remaining transparent.

2nd. Those morbid states of the eye which depend on derangement of the structure of the cornea, the anterior chamber being nearly or quite natural in its dimensions, the iris, the crystalline lens and its capsule being healthy.

3rd. Those morbid states of the eye which depend on any combination of the two preceding states of disease, or with a diminution of the anterior chamber of the aqueous humour.

In the first class are included.—

a. Those cases in which closure of the pupil has taken place, in a greater or less degree, after the operations of depression, reclination, extraction, or by division of the crystalline lens, with, or, without the formation of an adventitious membrane, or deposition of coagulable lymph. The capsule having been destroyed or not.

b. All cases of false cataract, of whatever description, wherein the lens, or its capsule, adhere to the posterior part of the iris, with diminution of the area of the pupil. The principal cause being inflammation of the iris, whether simple, or dependent on general derangement of health, syphilis, or rheumatism, the iris being more or less of its natural colour and structure, but plane on its anterior surface.

In the second class are included—

a. Those cases in which the cornea is rendered partially opaque (leucoma) in consequence of ulceration, operation, or other cause, preventing the transmission of light, or, impeding it so much as to render vision indistinct; but in which the anterior chamber, the lens and its capsule remain unimpaired.

In the third class are included the following cases.—

a. A slight attachment of the iris, drawing

the natural pupil to one side, with diminution of its size, the lens and capsule being transparent, the cornea opaque at the point of attachment.

b. The same with opacity of the lens and capsule.

c. When the iris is convex, but not adhering to a transparent cornea, the pupil nearly closed, the pupillary edge of the iris firmly adherent, the anterior chamber considerably diminished, or nearly destroyed.

d. The state *c* combined with opacity of the cornea, and attachment of the iris, including the natural pupil.

e. The state *d* combined with a staphyloma of the cornea, in a greater or less degree, the lens being present, or having been removed.

f. Either, or, all of the three last varieties of disease, combined with central opacity of the cornea, so dense and large, as to leave only a narrow transparent ring, the aqueous humour not being entirely wanting.

g. The states included in *f*, the iris in contact with the cornea, a segment of a narrow ring, at the edge being alone transparent, and the anterior chamber obliterated.

h. Other anomalous states, not included in the above, but requiring some modification in the mode of operating.

The formation of an artificial pupil, necessarily implies some derangement of the iris, the result of inflammation; for the closure of the pupil, the consequence of collapse of the eye from a discharge of the humours, or from atrophy, does not admit of relief. In the arrangement I have chosen, and in all the varieties of disease enumerated, I wish it particularly to be understood, that the simple closure of the pupil, is by no means the principal point demanding attention; for the estimate made of the actual state and appearance of the eye, connected with the previous history of the complaint, of which the closure of the pupil has been the result, ought chiefly to regulate our decision.

From the knowledge which every practitioner ought to possess of the effects of disease, on the system generally, and especially of what are called constitutional and specific diseases, such as scrophula, rheumatism, gout, syphilis, or irritative inflammation in unhealthy constitutions, he will gain considerable information, both in distinguishing and treating every complaint of the eye. This knowledge will enable him to discriminate the different shades of disease one from another, and prevent his forming erroneous conclusions. The mere inspection of the eye, will give him a general idea of the nature of the previous inflammation; a more minute one will point out the immediate local

derangement; and the history of the previous and subsequent constitutional, as well as local symptoms, will enable him to draw an accurate conclusion; and not only form a good prognosis as to the result of an operation, but what is of more consequence, will prevent his committing through ignorance, irreparable mischief.

If the deranged state of the iris, requiring the formation of an artificial pupil, be combined with amaurosis, glaucoma, varicosity, dropsy, or atrophy of the eye-ball, an operation must be useless, and in most cases even highly injurious, because the inflammation following the injury, will be very apt, in the four last cases of complication, to excite malignant actions, not easily to be suppressed, and even frequently destructive.

A natural state of the iris, as far as regards its colour, and apparent structure, with the exception of the derangement of the pupil, unattended by any other external or internal local morbid appearances, or symptoms of constitutional disease, with a tolerably accurate perception of light from darkness, is most favorable for operation; for, these appearances imply, that the inflammatory affection, which caused a closure of the pupil, was not particularly severe, or, was in all probability, neglected, and did not extend to the more internal parts of the eye.

A closed pupil, after the operation of extraction, (when performed in a proper case for that operation) offers in general a favorable prognosis; for the inflammation was, in all probability, simple, and caused by protrusion of the iris, or of the vitreous humour; and the iris will in general, by its otherwise apparently healthy structure, indicate the fact, which will be confirmed by the history of the inflammation. It is far otherwise, after the operation of depression, or reclination, except where the closure of the pupil has arisen from general high inflammation, which may even then have been productive of irremediable derangement. For when it has taken place from an imperfect depression, or, from constitutional predisposition for rheumatic, gouty, or irritative and unhealthy inflammation, the prognosis is bad, because the more internal parts of the eye have, in all probability, been irrecoverably implicated in the disease.

A general convexity of the iris, which otherwise retains a healthy appearance, may not indicate any posterior disorganization, but rather a continuance of healthy action in some parts behind it. The membrane lining the transparent cornea, has been called the membrane of the aqueous humour, on the supposition that it alone secretes that fluid; but this has by no means been demonstrated, whilst there are many facts leading to a contrary opinion; for,

although some may be secreted in the anterior chamber, the principal part of this fluid passes from the posterior to the anterior chamber, through the pupil, keeping up an equal pressure on both sides of the iris. If the pupil be closed completely, and the posterior secreting organs of the aqueous humour, remain in activity, the fluid thrown out behind the iris not being able to pass through, presses it against the cornea, and gives it the convex shape alluded to. The pupil, in a case of this kind, will appear completely closed or filled up by a membranous substance; but appearances here are deceitful, for, from the subtilty of the aqueous hum· the pupil may appear closed, when it is not actually impervious to this fluid, and vice versa. Bëer and Himly incline to the opinion I have stated, and the mode of obtaining relief, favors it remarkably. It is by first making a small opening at the place of the natural pupil, (perhaps removing the lens by depression) when the aqueous humour gets before the iris, and if it be not attached to the cornea, presses it back, and gives room for a subsequent enlargement of the pupil.

I have at present two cases under my care, demonstrating the fact in a very marked manner. In one, the woman had suffered from inflammation of the iris before she came to me; at the termination of which the belladonna had been applied to dilate the pupil, which it

would appear to a casual observer to have done; but, on a more minute inspection, it was evident, that, although the pupil was of a tolerable size, as far as regards the edge of the iris, which was also immoveable, yet in retracting, it had left behind it the pigmentum nigrum attached to a layer of coagulable lymph, which still closed the pupil, with the exception of an exceedingly small point, through which the communication was kept up between the anterior and posterior chambers of the aqueous humour. The best idea I can give of this state is, that it conveys the appearance of the iris, properly speaking, having retracted, leaving the uvea behind it. I operated on this pupil by separating the attachment of the iris, cutting into the lens, which was soft, and dilating the detached iris by the belladonna. During the operation, which was accomplished with difficulty, from the softness and toughness of the iris, the aqueous humour escaped by the side of the knife, and the iris was pushed forwards against the cornea, by the pressure of the lens and parts behind. The lens being soft, I did not fear ulceration from its pressure; but it effectually prevented communication between the two chambers, and no aqueous humour appeared in the anterior chamber, although little or no inflammation followed, until the lens began to dissolve, when the iris gradually and slowly receded. If the lens had been hard,

it must have been removed, either by depression or extraction, as it would have caused ulceration from pressure.

Against the opinion of Ribes,[a] Edwards,[b] and Majendie,[c] that the aqueous humor is secreted behind the iris, Cloquet has brought forward a very strong fact, viz. that a fluid, resembling in every respect, the aqueous humour, has been found in the anterior chamber, before the membrana pupillaris had yielded in the slightest degree; demonstrating then, (if the fact be correct) that some fluid is secreted before the iris, even if, as is supposed, the greater portion may come from behind the iris.

If the colour of the iris be altered, with little or very slight convexity, and no appearance of derangement of its structure, the change of colour will depend in all probability, on the effusion of coagulable lymph behind it; and the alteration of colour will be confined to the central part, or in a space not extending beyond the size of the crystalline lens, and generally less; the pupil will appear to be closed, although not completely contracted. In such a case, if there be any perception of light, and

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[a] Memoires de la Societé Medicale d'Emulation. Tome 8, 2nd part.

[b] Edwards. Memoire sur l'Anatomie de l'Oeil. Paris.

[c] Majendie, Precis Elementaire de Physiologie. Tome 1.

no pain or uneasiness, the operation may be successful. A greater convexity of the iris, will only shew a more perfect closure of the pupil. But if the iris be diseased, the prognosis is bad; and if a blue iris be changed to green, or a brown one to a dove colour, there is but little hope, for the eye will in general be found either soft or hard, amaurotic, or varicose.

The iris may shew little or no sign of derangement, beyond some change of colour, yet the retina may be perfectly insensible, (amaurotic) and the operation useless. In a case of this kind, the eye-ball, on pressure, will generally be softer than natural; and the history of the case will materially assist us, in forming our prognosis, as well as the patient's want of perception of light and darkness, or, his incapability of distinguishing the shadow of an object interposed between him and the light; for if he cannot distinguish day from night, the prognosis is bad; if he has scintillations, or flashes of light of different colours in the eye, it is worse; and if it be accompanied by pain, even at intervals, or varicosity of the vessels, an operation ought not to be attempted. The want of power to distinguish night from day, the pupil being closed, is not a sufficient reason for conceiving the retina to be paralysed; and if the eye is otherwise healthy, an operation should be attempted, for it has proved successful in many such cases, the patient slowly recovering useful

vision; and, if unsuccessful, it removes all doubt, and no bad consequences are likely to follow.

A closed pupil, resulting from inflammation, after a severe injury on the eye, including the forehead, and the lesion of the first branch of the fifth pair of nerves, is a case in which nothing can be expected: amaurosis being almost certain. The prognosis is equally bad in all cases of closed pupil, resulting from the passage of musket balls behind, or lodging and pressing on the eye; for, in every case in which I have removed a ball from behind, or from the side of the sclerotica, the eye has been amaurotic. It is not so, however, when the other eye becomes affected, as the closure of the pupil is the consequence of simple sympathetic inflammation affecting the iris, which ought to be prevented, or at least cured by the most active antiphlogistic and mercurial treatment. In all acute cases of iritis, bleeding from the temporal artery is of as much use as mercury; it frequently renders its operation more rapid and certain, and in healthy persons, should never be omitted. In all such cases, an attack on the sound eye may be expected, and the surgeon should be on the watch to meet and subdue it. The sympathetic inflammation is more to be dreaded than the occurrence of sympathetic amaurosis, one being generally the forerunner of the other.

The iris is occasionally so thin, and altered in appearance, as to shew a solid yellow lens adherent to its posterior surface, in which case absorption has taken place from pressure, the iris having been in part disorganized by the previous inflammation, which has also, in most instances, affected the retina. If there be no other unhealthy appearance, an operation may be attempted, at the desire of the patient; but it will in all probability, be unsuccessful. If the cornea be implicated, I think the prognosis better than if it be transparent, for then there is a greater probability of the more internal parts having been less affected.

If the whole of the iris be diseased, and convex, it becomes in parts puckered up and fleshy, bleeding on the slightest incision; and is of a dark blue dove colour, although sometimes a little lighter; the hollows between the elevations being more transparent; as if the iris were thinner at these parts, or the pigmentum nigrum was, as in the former case, partially or totally wanting. The general appearance of the eye does not, however, mark the case less than that of the iris, it is altogether unhealthy. The sclerotica is of a leaden blueish colour; two or three vessels of a brick-red colour are seen pursuing a tortuous course nearly to the edge of the cornea, which part itself does not retain its natural brilliancy. The eye is generally harder than usual; if it should be much so, and the

sclerotica, at the insertion of the recti muscles, especially the superior, the externus and internus, appear more discolored, the varicose state of the vessels of the choroid coat is distinctly marked; but if a bulging out of the sclerotica is perceptible at these parts, the blue colour of the choroid shining through its attenuated substance, the eye being of a flinty hardness, the state of cirsophthalmia cannot be mistaken. The eye is completely disorganized, and an operation must be highly injurious, and not unfrequently fatal.

Glaucoma cannot be very evident with a closure of the pupil, further than as it is generally accompanied by internal derangement of the eye, shewing itself by external appearances; such as a dull cornea, unhealthy looking sclerotica, tortuous brick-red distended vessels, advancing nearly to the edge of the cornea, leaving a blueish white ring around it; scintillations of light, without any perception of light and shade. The eye may be soft from disorganization of the vitreous humour.

If the eye be of increased dimensions, an operation is forbidden; and if it be considerably diminished, it is equally contra-indicated.

From the observations which have been already made, disorganization, or dissolution of the vitreous humour, (synchisis) indicated principally by softness of the eye-ball, will appear to be a frequent accompaniment of closed

pupil. It is so, because closed pupil is an effect of inflammation, and so is the disorganization of the vitreous humour, in an eminent degree. I do not intend to say it is the only cause, because I know it may takeplace in cases where the previous occurrence of inflammation is not admitted, and no traces of it can be perceived. Bëer says on this subject, although he does not peremptorily maintain it, that dissolution of the vitreous humour is either an effect of syphilitic inflammation of the eye, when traces of it may be observed; or, the consequence of the excessive and improper administration of mercury, particularly calomel, in persons who have long suffered from syphilis, and have contracted a mercurial diathesis or habit; or, where it had been in the same manner given to persons of an excessively weak and cachectic habit, and more or less inclined to scurvy.

I ought to enter here into a discussion, as to what is, or is not syphilis, before I express my doubts, as to the accuracy of Bëer's conclusions on this subject, for he may very readily consider certain inflammations to be syphilitic, which we do not believe to have that character, and consequently he is so far correct; but in waving the discussion, in this place, where it would be obviously improper, we shall still very nearly approximate in opinion, if I admit, what I am most ready to concede, that the inflammation in such cases, is not a simple in-

flammation, but always of an unhealthy character.

In regard to its being the effect of mercury, the difficulty is equally great, in deciding what is due to the mercury, what to the constitution; for, in thousands of persons, no such effect takes place; and I certainly have seen many cases in which the alteration could not reasonably be attributed, either to syphilis, or the improper exhibition of mercury.

This fluid state of the vitreous humour has been long known, especially as existing with true cataract, where it could not have been the result of inflammation, and has not been considered as forbidding even the operation of extraction. The Baron de Wenzel has a chapter in his book, on this very point, and gives the cases of two persons, from whose eyes he extracted three cataracts, the vitreous humour being in this state; and who saw as well afterwards, as persons usually do after an operation for cataract; although, in one case, three fourths of the whole quantity had been lost during the operation.

In general, when the vitreous humour is disorganized, the power of vision is not so good as De Wenzel mentions. Bëer says, it is either very weak, and the patient far sighted, or else it is reduced to a trifling and imperfect perception of light, if not to blindness. Sir W. Adams, in his late work on Artificial Pupil, says, page

117, " When the vitreous humour is transparent, its partial or total disorganization, does not appear materially to affect vision. For, after the cataract has been removed, or an artificial pupil formed, vision appears to be equally good, as if no such morbid change had taken place."

The subject seems to admit of very little discussion, for it is an acknowledged fact, that in no part of the human body, could any other structure be employed with the same advantage, as that which nature has adopted; if a disorganized state of the vitreous humour would have answered, even as well as the healthy state, there can then be no doubt but it would have been substituted for a structure, which is infinitely more complex; and it follows of course, both according to the laws of nature, and the laws of optics, that vision cannot in any case be as good, as when the vitreous humour is sound. The truth lies between the two extremes, and the state of vision depends on the nature of the derangement previously affecting the eye. When the dissolution takes place without inflammation, or such appearance of its principal phenomena, as entitle us to adopt that term for the morbid affection, the vitreous humour retains its transparency; and vision, although certainly more impaired in the most fortunate case of operation for artificial pupil, than in an equally fortu-

nate case of cataract, is still good, and enables the patient to see very well with the help of a proper glass. But, if inflammation should have preceded, and have been as far as we can judge, the apparent cause of this change in the vitreous humour, it will in all probability, according to the nature and severity of the inflammation, not only have lost its consistency, but its transparency, changing to a straw or yellowish colour, and even to a yellow, light green, or brown. The change to a straw colour is common to old age, but, the other states are always the result of inflammation, and vision is exceedingly defective, if not entirely destroyed. It is not the change of colour, however, which entirely prevents vision, for this defect often accompanies a transparent state of the vitreous humour ; but the amaurotic state of the retina, as a sequela of the original complaint. A deranged, if not a diseased state of the retina, is always to be feared in cases of closed pupil, when the vitreous humour is suspected to be fluid, although one is not a necessary accompaniment of the other, further than that inflammation is shewn to have been in actual contact with, and in all probability to have been communicated to the retina, or adjacent parts, capable of acting upon it. Whether the retina can, or cannot bear a degree of inflammation with impunity, which causes disorganization of the vitreous humour, I am not

capable of deciding ; but I well know, that inflammation of the retina, or choroides, frequently destroys vision; and in a case where the previous existence of general inflammation is tolerably evident, from the closure of the pupil, and the flaccid state of the eye, what proportion of it has fallen to the lot of each part, no one, I believe, will attempt to demonstrate. A diseased state of the retina generally implies a disorganized vitreous humour, although a disorganized vitreous humour does not always indicate a diseased retina.

In my Treatise on Cataract, when considering the merits and demerits of the different operations for cataract, combined with this state of the vitreous humour, I have entered fully into the different anatomical opinions upon this state of the eye, and I have given it as mine, that the disorganization principally consists in a removal of the membranous septa of the hyaloid membrane, rather than in a very material change in all its constituent parts. Bëer admits, that in all these cases, the hyaloid membrane becomes particularly thin and crisp, so as to be readily ruptured, on the application of the slightest exciting cause. I conceive that the hyaloid membrane, itself, actually undergoes the same process of dissolution, especially at its anterior, and inner part ; and that the lens, enclosed in its capsule, sinks at last to the bottom of the eye,

from the dissolution of the hyaloid membrane, depriving the capsule of its principal attachments.

In such a case of closed pupil, the history of the disease, and the appearance of the diseased eye, will materially assist us in forming our prognosis. If the inflammation, which closed the pupil, was moderate, simple, and in a healthy constitution; the iris good, the eyeball not diminished in size, although soft to the touch; and, if the patient can distinguish light from darkness, the prognosis is favorable, for the retina is in all probability, unaffected, the vitreous humour transparent. If the eyeball be diminished, the danger of amaurosis is much greater, although not certain; and, according to the appearance of the other parts of the eye, the prognosis may, in the same manner, be formed. It may however happen, that the vitreous humour, and the retina, may be both diseased, and accompanied by closure of the pupil, without any flaccidity or diminution of the eye; it may be even firmer than usual; but the surgeon must be suspicious of a varicose state of the organ, and turn his attention particularly to the symptoms of that state, which have been already enumerated.

When the disorganization of the vitreous humour takes place, without a closure of the pupil, and with or without the appearance of a cataract, a due discrimination of the nature

of the disease is of the greatest importance, especially if there be a cataract, and an operation has been proposed. I have been sufficiently premonitory on this point, in my work on Cataract, to which I refer. The particular symptom to which I wish to attract attention, is the state of the iris. The appearance of it at first sight is nearly natural; the pupil is very sluggish in its motions, sometimes slightly irregular, yet, sufficiently obedient in most instances to the belladonna, applied in the usual manner; but it has acquired a motion it does not possess in a healthy state of the eye, a vaccillating motion backwards and forwards, such as a rag would have, if agitated in a glass globe, not quite full of water; or as some have compared it, to the unsteady motion of a well poised magnetic needle, which is perceived on making the patient move the eye-ball rapidly; and which, when once seen, can never be mistaken. When combined with softness of the eye-ball to the touch, it is perfectly diagnostic of a disorganization of the vitreous humour; when the eye-ball retains its firmness, without symptoms of varicosity, and a cataract be present, it marks it to be membranous, or fluid.

I know of but one apparently healthy eye, in which the iris has this motion to a certain extent, and I admonished this person, that if he should ever suffer from cataract, he ought not to have it extracted.

The fact which I wish to be adduced from this digression is, I apprehend, of some little importance, viz. that the iris will frequently retain this intestine kind of motion, although the pupil be closed, and more especially if the lens should have fallen back into the vitreous humour. I have a case now under my care, in which it is exceedingly well marked, whilst the other appearances are equally demonstrative of the nature of the morbid affection.

But it will sometimes happen, after all our attention, that with exactly the same appearances, to our senses; one eye shall be found to be good, the other the reverse; and even the most favorable to appearance, the most injured by disease.

I have lately seen a young lady, who became blind from closed pupil, the result of inflammation of the iris, when a girl, and who, after the disease had existed seven years, had the operation performed on both eyes, for artificial pupil, by Sir W. Adams. In each, the lens separated with its capsule, and sunk to the bottom of the eye: the eye which appeared the best, and of which most hope was entertained, was found perfectly amaurotic. With the other, the patient sees very well; and, after a lapse of five years, the lens enveloped by its capsule, but shrunk, irregular, and more spherical than usual, is seen moving towards the cornea from the bottom of the eye, on every sudden motion of the head. The eye is very soft, the vitreous humour per-

fectly transparent, the iris a mere ring around the inner edge of the ciliary ligament. The lady is subject to head-aches, frequently severe; and she always feels, on a sudden motion of the head, the sensation of something moving in the eye. This case I consider as a very valuable one, for it shews, that after simple inflammation of the iris, ending in cataract and closed pupil, the retina may be healthy or unhealthy, the eye which was considered to offer the best prospect of a favorable result, being in this case the worst. That softness of the eye to the touch, implies merely a disorganization of the vitreous humour; which, as it is a general accompaniment of disease of the retina, renders the healthy state of that membrane doubtful; it also shews that in performing an operation on such cases, it is not possible to extract the lens in the manner recommended by Sir W. Adams, unless it accidentally slips into the anterior chamber, as it sinks to the bottom of the eye, from whence it must be fished up with a hook: and, that the lens remaining in this state, in a disorganized vitreous humour, does not cause all the mischief generally attributed to it. In proof of which, many other instances might be adduced, even more than to shew the contrary.

Finally. In no case should the operation be attempted, where the eye is not perfectly free from inflammation of every description, especially from all trace of that which caused the closure of the pupil; a well regulated local

treatment will then be often required, previously to the performance of an operation to remove a chronic state of irritation, which frequently remains after the principal disease has been removed. The state of the constitution will demand fully as much of our attention, for no man in the slightest degree acquainted with the practice of surgery, can be ignorant of the influence it exerts upon local injuries, and how much the success of surgical operations depends upon the soundness of the constitution. A correct medical treatment will often be absolutely necessary to re-establish the health of the patient, and any predisposition to derangement should be studied, as well as his actual state of disease; for a person predisposed to rheumatic or gouty inflammation, should not be operated upon, whilst a fit of the latter is impending, or even expected; or, the state of the weather, the season, or any premonitory signs, render the prospect of an attack of rheumatism, probable; for in such cases the operation would be liable to excite in the eye, an inflammatory action of the character to which the patient is predisposed, and which would, in all probability, prove fatal to vision. In the same manner, persons suffering from a syphilitic, mercurial, or generally cachectic habit, should be as nearly as possible, restored to their natural state of health, before the operation is attempted.

FIRST CLASS.

Those morbid states of the eye which depend on derangement of the structure and function of the iris, or, of the crystalline lens and its capsule, the anterior chamber of the aqueous humour, preserving its natural dimensions, the central part of the cornea remaining transparent.

SECTION *a*.

Those cases in which closure of the pupil has taken place, in a greater or less degree, after the operations of depression, reclination, extraction, or by division of the crystalline lens, with, or without the formation of an adventitious membrane, or deposition of coagulable lymph. The capsule being destroyed or not.

THE most favorable cases for the operation of artificial pupil, by division,(coretomia) are those contained in section *a* of the first class, in which the closure of the pupil is the result of inflammation, consecutive to the operation of extraction. They are so, because the inflammation has occurred in an eye, in general free from disease, from its having been, for the most part, confined to the iris, and from its being fre-

quently on the stretch, from some slight attachment to the lower and inner edge of the cornea.

When the operation of extraction has been successfully performed, it will be recollected, that the anterior capsule of the lens must have been cut in pieces, so as to offer no point to which the iris can adhere: it must then be in consequence of a very high degree of inflammation, or in a very neglected case, that an adventitious membrane can form behind the pupil, so as completely to prevent the passage of light to the retina; for the iris rarely closes in a case of this kind to a point; and if the inflammation does cause the formation of a new membrane, through the deposition of lymph, it may be removed with the needle, without dividing the iris, nearly as in a case of secondary capsular cataract. But more frequently, the closure of the pupil demanding the formation of an artificial one, has been caused by inflammation, the consequence of pressure on the iris, in the passage of the lens through the pupil; in which case the capsule of the lens will seldom have been completely destroyed, and the pupil will adhere to it; or, the admission of light at the moment of extraction, has not been well regulated, and great inflammation has supervened. The iris may become attached to the inner edge of the incision in the cornea, or probably in part protruded through it, giving rise to inflammation of the iris, and subsequent closure of the

pupil. In the first two instances, the iris is perfectly plane, and its fibres hardly on the stretch. In the two latter, the iris is protruberant at the lower place of incision, the pupil drawn towards it, and the fibres much on the stretch in the opposite direction. If the depth of the anterior chamber is unimpaired, or diminished only in a trifling degree, the operation by division, is, in all, the most applicable. Mr. Cheselden, it would appear, intended it for these particular states, and from endeavouring to extend its application to others, it seems to have fallen into disrepute; for, at that time, the solubility of the lens in the aqueous humour was unknown, its extraction not practised, and the sufficient enlargement of the wound in the iris, by repeated attempts with the knife, not insisted on, from the fear of evacuating the vitreous humour. As I have stated, in the history of the operations, Sir Wm. Adams has the merit of reviving it; and I think it due to him to describe it in his own words.

"The patient being seated, as in the operation for cataract, and the eye being steadied, either by the finger of the assistant who supports the upper lid, or by gentle pressure made with my concave speculum, the iris scalpel already described, with its edge turned backwards, must be introduced through the coats of the eye, at their external part, about a line behind

the iris, and in the transverse diameter of the latter membrane.* The point of the instrument should then be made to penetrate through the iris, into the anterior chamber, in a line with its central diameter, and somewhat less than one third of the width of that membrane, from its ciliary margin. The iris scalpel is then to be carried cautiously through the anterior chamber, towards the inner canthus, keeping its edge in contact with the iris (in order to prevent the point from piercing the internal part of the cornea) until it has traversed more than two thirds of the width of the iris, when it should, with great care, be drawn backwards, almost out of the eye, making the most delicate pressure with the edge of the instrument, against the iris, lest it should be detached from the ciliary ligament. If the division of the iris is not effected to a sufficient extent, during the first effort, the iris scalpel should be again carried forward, and withdrawn in a similar manner."

"This is to be repeated as often as may be necessary to effect a division of the iris, to the

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* Before the eye is fixed, the patient should be desired to turn the eye slightly towards the nose, which trifling obliquity, enables the knife to be passed in front of the iris with more facility. It should also be introduced half a line below the transverse diameter of the eye, on account of the ciliary vessels; and the iris scalpel employed, should be the smallest usually made. G.

extent of a third part of its diameter. In my work, published in 1812, I directed that two thirds at least, of the extent of the transverse diameter of the iris, should be divided, in order to guard against the supposed disposition in that membrane, to re-unite; but abundant experience of the favorable results of this operation, which have since occurred in my practice, has convinced me, that no such apprehension need be entertained, and that a division of one third the extent of the diameter of the iris, is sufficient. Indeed, so far is there from being a disposition in the newly-formed pupil to close again after it has been once established, that the very reverse is the case; for the radiated fibres subsequently contract in a greater degree, from delay; whereby the artificial pupil is proportionably enlarged. In the species of case now under consideration, an almost immediate contraction of the radiated fibres of the iris, usually takes place, after that membrane has been divided, which produces a new pupil, of a sufficient size, for all the purposes of vision."

The operation, as it is here described, offers no difficulty, until the attempt be made to cut the iris by withdrawing the knife. The description of the division of the iris, by the most delicate pressure, or, fibre after fibre, or, by a pressure equal to the weight of a drachm, which have been given, are perhaps intelligible to a

general reader, but are not sufficiently precise for the medical student who intends to perform the operation. This does not arise so much from a deficiency of terms, but from the state of the iris being essentially different, in different instances; so, that out of six or eight cases apparently similar, in no two, will the iris be divided with the same degree of pressure, or facility; the appearance of the pupil, from an incision of equal extent, being probably different in all. In some cases, the iris will yield and separate to the most delicate pressure of the knife, and the pupil appear to be instantaneously formed. This is often the case, when the pupil has closed after the operation of extraction, where the capsule of the lens has been removed; it is generally so, when there is a slight attachment of the iris to the inner edge of the incision, which puts its fibres on the stretch, and renders them sufficiently tense to resist the pressure of the knife, and yet yield to its edge. In these cases, the iris is but little altered from a healthy state, or perhaps in a slight degree at its centre, and the circular fibres once divided, the superior and inferior radiated ones separate the edges of the incision to a reasonable distance. I would describe them, as cases in which the iris gives way to a delicate pressure, yielding fibre after fibre, in such rapid succession, as to render the division almost simultaneous, but proceeding no further than the extent of the incision. In

many cases of closed pupil, when the preceding inflammation has been so violent as to alter the structure of the iris, rendering it much thinner than natural, and more often when accompanied by amaurosis, the iris does not only give way to moderate pressure, but yields to the most delicate touch, flying, as it were, before the knife in every direction, so that all that remains to be seen of the iris, is a small ring, forming nearly a complete circle at the junction of the cornea and sclerotica, exposing a more or less clear vitreous humour, perhaps containing a floating and diminished lens, or an opaque capsule behind. I believe, in this kind of case, the capsule of the lens does not adhere to the posterior part of the iris; and I have seen the same thing take place where the iris was so thin that a solid yellow lens could be distinctly seen behind it. The iris flew to the ciliary ligament, the lens sunk to the bottom of the vitreous humour, or, in a less marked case of general derangement, the diminished lens remained supported by its lower attachment. In the greater number of these cases, the iris is evidently more or less changed in structure and appearance; frequently it is of a dove blue colour, but not puckered, and but little irregular.

Opposed to this state, is the closed pupil, the result of inflammation from an injury, where the lens has been absorbed, and the cap-

sule firmly adherent to the iris, or, in some few cases, from specific inflammation, as of gout, rheumatism, or syphilis. In these instances, the anterior capsule, or both anterior and posterior, are thickened and firmly attached to the iris, the fibres of which have no longer any power of action; there is but an indistinct perception of light, and the smaller circle of the iris, is in general more discolored, indicating a greater deposition of lymph behind it. In a case of this kind, the knife will not penetrate the iris and adherent capsule, by any force; for, if it be increased, so as to render it effectual, the iris will be torn from the ciliary ligament; it will give way rather at its circumference than at its centre. When pressure is applied, the iris, it is true, yields to the knife, but it is not divided; if the pressure be increased, the knife is seen to carry the iris before it, deeply backwards to the centre of the eye, and when it is withdrawn, this impression remains on the iris, as a permanent mark, but without any perfect division having been effected. A case of this kind presented itself to me three years ago, in a woman, on whom this operation had been attempted by Sir W. Adams. The mark of the knife, with a corresponding depression of the iris, remained in its transverse diameter, but no opening was made. It is but fair to add, that I repeated the operation, but with an equal want of success, and the woman refused to al-

low of an attempt at division with the scissors, which would, in all probability, have succeeded.

The proper operation for such a case, is the coredialysis, or separation at the ciliary ligament, for the formation of a triangular opening by the scissors, would not be easily accomplished to a sufficient extent; and the simple division of the central part of the iris, would be, in all probability, ineffectual, in consequence of the thickened capsule preventing the necessary retraction of the fibres of the iris. In cases where the capsule has become thickened after extraction; the same difficulty is experienced, but in a minor degree, and the iris is pressed so far back, before it is cut, that if practitioners are not made acquainted with the fact, they will fail from not applying a sufficient degree of pressure. It is at this moment that the iris may yield at the ciliary ligament, and which must put a stop to all further attempts to divide it, as they will only increase the separation. But, in a case of this kind, when once the iris has yielded at the ciliary ligament, its separation should be seconded by gentle pressure, until a sufficient space has been obtained for a new pupil. The operator, in consequence of the accidental separation, changing his mode of proceeding, and adopting that which Bëer, and other continental surgeons think the best. There is also, one thing of importance to be recollected, which is, that a spontaneous separation, as it may be termed, of

the iris from the ciliary ligament, never closes, whilst it frequently does so, when purposely effected, except it be strangulated in the opening in the cornea; the difference being, I conceive, dependent, in the first instance, on its being a complete separation of the border of the iris, whilst, in the latter, it is in many instances, a rupture within the border, and which, therefore, renders the strangulation of it in a wound of the cornea, necessary, to prevent its re-union.

If an opening should be made by the knife, and another by the separation of the iris, so as to make two pupils, and thereby confuse vision, they must be laid into one, at a subsequent period, by a stroke of the scissors, after having made an opening in the cornea.

In other cases, the cellular structure of the iris seems increased in quantity, and it becomes tougher, and more distensible, so that the knife, on entering at the temporal angle, may pass over towards the nasal angle, carrying the iris with it, without completely dividing it; and repeated attempts, in the same line of incision, will be necessary, before it can be sufficiently cut to effect an artificial pupil of proper dimensions. If the vitreous humour be thin, or disorganized, it will escape so rapidly, during these repeated attempts, that the eye will become flaccid; for it must also be known, that if the knife be withdrawn nearly from the

eye, after the first attempt on the iris, and a second and third be made, the opening in the sclerotica is increased, sometimes even to nearly double its original size, and the evacuation of the vitreous humour becomes proportionably more rapid. This loss will be, however, of little consequence, provided the artificial pupil has been made, as it will shortly be re-produced; and the operation is followed by less inflammation from the flaccidity of the eye admitting of greater vascularity, without a corresponding degree of tension.

The division of the iris is by no means, then, a certain operation, as far as regards the quantum of pressure to be applied; it must also be borne in mind, that steady pressure does not cause a knife to cut, without it be accompanied by a slight motion forwards or backwards. Every knife requires to be drawn along a part, to effect a division, and this saw like action, is the more necessary, in proportion to the want of resistance behind. In dividing the iris, it must not be forgotten, that it is for this reason, the knife is directed to be withdrawn nearly to the point, by a double motion of pressure backwards, and removal outwards; and in doing this, attention is necessary to a third circumstance, that the back of the knife be constantly kept in contact with the sclerotica, next the cornea,

which acts as a fulcrum, or point of support, and prevents the opposite part of the sclerotica from being cut, at least, in any great degree. In other words, the knife is to act as much as possible without increasing the external opening.

In making these repeated attempts on the iris, the edge of the knife should always act on the same line, so that the iris may not be cut in two parallel lines, which may always be managed without difficulty, yet one part may yield more readily than another, and two pupils may be formed in the same direction, separated only by a narrow slip, not easily divided when the iris is flaccid. This once occurred to me, and rendered a second introduction of the knife necessary; but, if a considerable quantity of the vitreous humour should have escaped during these repeated movements of the instrument, the iris will have become so flaccid from the want of posterior support, that it cannot be cut, although it may be torn from the ciliary ligament, and the surgeon must abstain from further proceeding, until the eye shall have again become firm from the re-production of the humours, when he may endeavour to complete his operation.

I am aware that in stating all these circumstances, as attending and occurring in the most simple of the operations, it may lead to the opinion that the whole process is exceedingly difficult; but, which I should very much regret, as it is

really otherwise. I only wish to forewarn students and young practitioners of the difficulties, they may meet with in practice, that they may be prepared, and not have to learn them entirely from personal observation; and I beg to be understood as not giving the results of my own practice alone, but, that of other practitioners of greater pretensions, whose operations I have either been witness of, or have had reported to me by competent judges.

I again repeat, that I am writing for those who wish to learn, and I leave the correctness of the foregoing observations to be decided upon by the experience of those for whom they are intended. For I should have failed in my duty, as a teacher, if I had not made them acquainted with the nature of the untoward accidents, which they have seen occur in the hands of men of the greatest reputation in this town; and which, when occurring to themselves, they might have attributed, without this explanation, to their own want of dexterity.

SECTION *b.*

Containing all cases of false cataract, of whatever description, wherein the lens, or its capsule, adhere to the posterior part of the iris, with diminution of the area of the pupil. The principal cause being inflammation of the iris, whether simple, or dependent on general derangement of health, syphilis, or rheumatism, the iris being more or less of its natural colour and structure, but plane on its anterior surface.

The presence of the lens in addition to a diminution, or obliteration of the pupil, renders an operation more complicated, but not at all times more difficult. The lens may be of its natural size, transparent or opaque, hard or soft, the capsule simply opaque, or thickened, tough, slightly or strongly adherent, or remaining in situ, the eye soft, the vitreous humour disorganized. The iris may be discolored, and the lens, of a yellow colour, solid, and even shining through it.

The operation must be performed according to the nature of the case.

When inflammation of the iris is neglected, or improperly treated, a deposition of lymph

takes place behind it, upon the capsule of the lens, uniting it to the uvea, contracting the size of the pupil, and preventing the passage of the rays of light, through the crystalline lens, to the retina, forming what is called, cataracta lymphatica. If blood be intermixed with it, cataracta grumosa, and the lens may be in either case, opaque or transparent, although generally soft, and easily separable into pieces, or from the iris. If the inflammation of the iris has been violent and neglected in the first instance, the pupil will frequently close nearly to a point, and when the belladonna is applied at a subsequent period, the iris seems to retract, leaving a portion of the uvea or pigmentum nigrum, attached to the lymph adherent to the capsule of the lens, so that the pupil will, on a casual inspection, appear to be of its natural size, whilst it is in fact nearly closed. In many cases, the eye will have become amaurotic, whilst in others, the patient can see, although imperfectly, through a very small opening, the lens in both instances, being generally transparent. Cataracta choroidalis of Richter.

In the cases to which I am alluding, the diameter of the pupil is not less than one line, in some instances more, and although the edge of the iris is adherent, so as to render it immoveable, still the lymph deposited behind it, seems to be laid upon the capsule of the lens,

rather than to form one part with it, the iris itself even in its smaller ring, is hardly, if at all, discolored; or, a slightly greenish tinge may be discovered in one which is naturally blue, and a deeper tinge of colour in one that is usually brown.

In such cases, the motion of the iris appears only to be prevented, in consequence of its attachment, and the objects of an operation seem to be the freeing of the attachment, and the removal of the opaque parts. This may be accomplished by the introduction of a needle behind the iris, so as to separate it from its attachments; and subsequently to open into the texture of the lens; for, as the passage of the needle behind the iris, necessarily renders the lens opaque, if it be transparent, the removal of it becomes necessary to vision. In this operation, the iris need not be divided, except at any part where it may be too firmly attached to be separated, and the belladonna must be applied immediately after the operation, to dilate the pupil, and separate it more permanently from the parts behind, in which state of dilatation it must be retained until the lens is dissolved. In some cases, the iris although separated, will still be immoveable, from the cohesion, of its fibres, one to another, from the effusion of coagulable lymph in its posterior part, although this may not be strongly indicated by a change of colour.

If after the iris be detached, the pupil is likely to be too small, the point of the needle must be advanced through the pupil, and the inner edge of the iris divided, as far as may be necessary, to ensure a pupil of a proper size. In some instances, as well as in others of the subsequent cases, the operation may require repetition, to effect the complete removal of the lens. Scarpa, in his Letters published in the Edinburgh Medical and Surgical Journal, vide No. 60, does not admit that such a state of eye exists, in which the adherent cataract can be separated, and the natural pupil remain of sufficient magnitude for useful vision. The dilatation of the iris, by the belladonna, after the operation in these instances, removes the difficulty, and the division of the inner, or even if necessary, the outer edge, which is recommended, if necessary, removes, I conceive, his principal objection; and the practicability of the operation is proved in the case related, page 94.

In cases where the pupil is more contracted, so as not to leave an opening of a line in diameter, and where there is every appearance of a more firm attachment to the capsule of the lens, the operation by division, may be attempted, whether the lens be opaque or transparent, soft or more solid, but it is fortunately in most instances soft, and easily divided. The operation is to be begun and continued, as in page 112, until the iris is about to be divided,

when the operator must proceed by making the opening into it, larger than when the lens has been removed, as it is more likely to close at its angles.

The lens is at the same time to be cut into, and as soon as the opening in the iris is sufficiently formed, to be cut in pieces in every direction, and as much as possible, brought into the anterior chamber. The complete division of the lens into small pieces, will seldom be effected at the same time as the artificial pupil is made, so that one operation may suffice for both; but a second will generally be necessary to complete the destruction of the lens, and which may be done with the needle, as in soft cataract, provided the pupil has been made sufficiently large. The principal object of the first operation, is to make an artificial pupil, and to open the texture of the lens. The iris, if the lens be hard, is readily divided, but the cut edges do not always separate, in consequence of an attachment behind, which must, if possible, be destroyed; the incision enlarged to at least, two thirds of the extent of the iris; and the edges pushed asunder by the side of the knife; the capsule being alike the cause of the non-retraction of the fibres of the iris, and of their re-union. The lens, which has been in part, cut up by these different motions of the needle, is now to be more separated in its texture, and

brought forwards, so that what remains behind, (if in any quantity,) may be more exposed to the action of the aqueous humour. At this period of the operation, Sir W. Adams particularly insists on a portion of the lens being cut off, and placed as a plug or wedge between the edges of the incision, in order to prevent their re-union, by the first intention, until all disposition for it, has ceased; he also thinks that the fragments or portions so interposed, tend to promote a contraction of the radiated fibres, whilst the artificial pupil is made to assume a transversely oblong shape.

On this subject I have to remark, that if the fragments be not attached to some portion behind the iris, they will not readily remain in the desired position, but fall forward into the anterior chamber, from the usual law of gravity; and in fact, the accomplishment of this part of the operation, is in most cases, as much an act of necessity, as of choice; the opened texture of the lens hanging out in considerable portions. As to the utility of a part of the lens acting in the manner of a plug or wedge, it is in some instances, extremely questionable, whilst in others, it may be advantageous. If the iris has been readily divided, and has retracted with little adhesion, to a sufficient distance, mechanical irritation is injurious; for so far from tending to promote a contraction of the radiated fibres, as he sup-

poses, it has, and must have a contrary effect; being another cause of inflammation and its sequelæ; and such a manoeuvre should not therefore be attempted.* But, if the edges of the iris cannot separate to a sufficient distance, from the firm adhesion they have to the capsule behind, the adhesion must be separated as I have directed, by gentle pressure with the side of the knife, and the interposition of a plug or wedge will be highly serviceable; but, the plug does not here act on the iris, but, on the edges of the capsule which are not irritable, and to which it is attached, and which can generally be seen, of a whitish appearance, extending beyond the edges of the fibres of the iris, and protecting them from injury. In dissenting then as to the manner in which the fragments act on the iris and capsule, and their advantage in all cases, I agree in the opinion as to their utility in the particular cases, and in the manner alluded to, and which cases are naturally frequent, from the disease being a consequence of inflammation.

If the lens be found too hard to admit of division, the operator will do well to defer the remaining steps of the operation until a subsequent period.

According to the directions which have been

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* Vide Dr. Ryan's observations on the subject, Page 76.

given, the central third of the iris, or very little more, is to be divided in a favorable case for an artificial pupil. Where the lens is to be cut up, a larger opening must be made; and, if the capsule be thick and firmly adherent, it must be further extended; yet if the lens be so solid as not to admit of division, this opening will even be too small to allow of its extraction. The incision of the iris must then be increased so as to exceed the diameter of the lens, which is to be pushed into the anterior chamber. On this point, Sir W. Adams simply says,* "But if the lens be found too hard to admit of division, or if it should separate from its adhesion to the iris, before the operator is enabled to effect that important object, he should at once bring it through the new pupil into the anterior chamber; and, after making a sufficient opening in the cornea, extract it with a hook."

The directions given here are explicit, but are by no means readily executed. I have shewn that the pupil must be divided, at least to the extent of the diameter of the lens, which is contrary to the first principle of the operation; but even then, the lens cannot come through, unless the fibres of the iris retract very considerably, which

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* Page 38.

they can not do, if they are attached to the capsule, or, lens. If the capsule be thick, and the attachment strong, the extraction of the lens is out of the question, for the slit in the iris will not be equal to the thickness of the lens, even if its edge be turned upwards; and as to forcing it through, after it has been dislocated, it is not to be accomplished with safety to the organ. It frequently requires a little trouble to effect it in a dilated state of the natural pupil, and surely it must be considered impracticable in a narrow artificial one. Indeed, the lens, once dislocated, will sink of itself, and although it may be moved behind the iris, it will never be brought through it, especially if the vitreous humour be in any degree disorganized, in which case there is little or no resistance. It is true, in some instances, the iris immediately covering and adherent to the lens, will separate with it, on being touched; in which case it is virtually in the anterior chamber, and may be extracted, provided it does not sink to the bottom of the eye; but, that eye will yet be useless, because it must be amaurotic. In another case where the iris flies to the ciliary ligament, a hardened lens may be found behind, in some rare instance, and may be pushed forward; but, it will sink directly on the patient's being placed on his back, and the extraction will become unadvisable, even if practicable.

I am ready to admit that a case may be met with, in which, after the artificial pupil has been made, by the introduction of a knife behind the iris, the hardened lens may be pushed through it by the same instrument into the anterior chamber, and then extracted; but I have no hesitation, in saying the instances must be very rare, and that the operation by extraction, performed in this manner, does not apply, or, succeed, in any one case in a hundred, and therefore should never be attempted, where the lens is presumed to be hard, and firmly adherent.

If the solidity of the lens be inferred, extraction through an opening in the cornea and iris, or the coredialysis are alone to be considered admissable; in the first method, the operation for artificial pupil, should be attempted anterior to the iris. The patient ought to be placed on his back, and an incision of one third at least of the circumference of the cornea be made at the external edge of it, to allow of a ready entrance to the different instruments. The iris is next to be divided, and it may be done in different ways; by the introduction of the sharp blade of a pair of scissars, through it and below the lens, so as to cut both at one stroke; the divided lens is then to be extracted by a hook; or, a blunt pointed knife may be introduced under the cornea, and its edge turned towards the iris, which is to be cut across

by withdrawing it, and by as little derangement as possible to the parts beneath; the lens is then to be hooked and extracted. But, one cut with the knife, or one stroke of the scissars, will not always be effectual, as in Professor Maunoir's case of the Marquis de Beaumanoir; vide Medical and Chirurgical Transactions, Vol. 7, part 2nd. in which a second and diverging cut was necessary to make a good pupil, and afford room to extract the lens.

The operations on the iris with the scissars, of the Professors Maunoir and Scarpa, are given in their own words from pages 25 to 31, to which I refer. The points considered by them as fundamental in their methods, are, Firstly, that the internal parts of the eye, and especially the annulus gangliformis are uninjured. Secondly, that the opening in the iris is made at a distance from the wound in the cornea, and the newly formed pupil is therefore not liable to obstruction from any opacity which may arise in consequence of the wound in the cornea. Thirdly, that the lens is removed by extraction instead of being left an irritating substance, to be dissolved by the humours, and ultimately absorbed.—Against these advantages, are opposed, the greater liability to inflammation from a large opening in the cornea, the difficulty of cutting the iris in a flaccid state, even with a pair of scissars, the possible escape of the vitreous humour; and to these have been added the diffi-

culty of cutting a hardened lens by a pair of scissars. Professor Scarpa, in enforcing the use of the scissars, objects to that of the knife. Sir Wm. Adams objects as strongly to the scissars, but, I do not conceive that either view the question without prejudice, or confine their objections or arguments, to the points of the greatest importance. The object of each seems to be, to prove that the operation he recommends is the best in all cases, without admitting that in some instances, the operation of his opponent may be preferable; arguments and objections are then brought forward upon points to which they have not sufficient reference, and each operation is condemned generally, because it is not perfectly successful in cases to which it is not applicable, or, in which the same objections may be urged against any other. Viewing the subject as I have endeavoured to do, and concluding that operations are to be adapted to eyes, and not eyes to operations, and attributing to each morbid state of eye, that operation which appears most applicable to it, much of the difficulty will vanish.

Professor Scarpa, in his last Work on the Diseases of the Eye, 1819, by Briggs, page 372, and in the 60th number of the Edinburgh Medical and Surgical Review, enumerates all his objections, as if they could occur in every case, whereas, it will be seen from what I have already said on the subject, that they

cannot possibly occur in many. There is one objection however advanced by Scarpa, which is a very fair one, it is the difficulty and danger which he says Sir W. Adams confesses to attend his operation, and the great dexterity and delicacy of hand, which he considers necessary to enable an oculist to perform it correctly. Scarpa then reasons naturally enough, that if these requisites be necessary in a greater degree than in any other kind of operation on the iris, those operations are preferable, which only require the usual degree of both. It is not surprising then, that on every point connected with this operation, he should magnify the danger and difficulties attending it.

To Scarpa's 1st. objection, that the knife cannot be passed in front of the iris when it is convex, the answer is, that in such a case the operation is not applicable. To the 2nd. that the iris may separate at the ciliary ligament during the operation. We must acknowledge its correctness, although it seldom happens, in a well selected case, and advantage can even then be taken of it. To the 3rd. the difficulty experienced in dividing the iris "fibre after fibre," so as not to leave an irregular pupil, I refer to my observations, on the different states of the iris, and the mode in which it is divided. Page 114 et seq.

The 4th. objection is a well grounded one. The difficulty of disposing of a hard lens even if the iris be cut, without a repetition of opera-

tions, which are always more dangerous behind the iris. The answer is simply, that in such a case, the operation by division through the sclerotica, although practicable, is by no means the most applicable.

Sir W. Adams, page 91 of his last work on Artificial Pupil, acknowledges, that Professor Maunoir's methods of operating with the scissars are highly ingenuous, and he further adds, "I have no hesitation in offering a decided opinion, that they are superior to all other methods of forming an artificial pupil, by effecting an opening in the cornea, which had preceded them." He objects to them however, for the following reasons. Page 92 et seq.

"1st. When the closure of the pupil results from the operation for cataract, it frequently happens that the vitreous humour is so morbidly fluid, that the entire discharge of it would certainly ensue, were Professor Maunoir's method of making a double incision of the iris, commonly practised."

"This diseased change of the vitreous humour, has frequently occasioned its escape so abundantly through the puncture of the coats of the eye, by the side of my smallest sized iris scalpel, as completely to occasion their collapse. Now although this fluid will generally be reproduced, yet, if atmospheric air be admitted into the posterior cavity of the eye ball, it will generally give rise to violent inflammation and

suppuration, terminating in a total destruction of the organ."

"Every surgeon, at all conversant with ophthalmic surgery, must be aware, that these accidents are far more likely to occur, when the cornea has been opened, and a large artificial pupil formed in the manner recommended by Professor Maunoir, than when the iris scalpel is employed, in the manner I have described, and recommended."

These objections of Sir W. Adams's, do not rest on matter of opinion, but of fact; and it then becomes a question, whether a greater loss of vitreous humour is sustained, in consequence of an opening through the cornea, than through the usual opening in the sclerotica, and, whether air is admitted by one opening and not by the other?

As far as my observation has enabled me to form an opinion, I have no hesitation in saying it does not accord with that given by Sir W. Adams.

In operating with the scissars, the patient is laid upon his back, the eyelids are separated, and after the cornea is opened, little or no pressure is required to be made on the eye; the scissars can be readily introduced beneath the flap of the cornea, and the first cut is made in the iris, before a drop of fluid vitreous humour escapes.—If the opening in the cornea, includes one third of its circumference, which is

the greatest extent of opening required, the flap is easily raised, no pressure is made on the sclerotica, and the vitreous humour which escapes, is not forced out, by the pressure of the instrument, but by the action of the muscles of the eye ball, the effect of which is counteracted by the remaining two thirds of attachment of the cornea, and by the recumbent position of the patient. When once the scissars are fairly introduced beneath the flap of the cornea, the eye becomes in general sufficiently steady, to permit the operator to use them with effect, although some, and often considerable difficulty will occur, as in the other operation, from the flaccidity of the iris. But as there is no pressure directed backwards, the vitreous humour does not escape in such quantity as has been, or might be supposed a priori. Sir W. Adams distinctly admits that by his operation, the vitreous humour frequently escapes so abundantly, through the puncture in the coats of the eye, as completely to occasion their collapse; now, nothing more can possibly happen by the other method; and I assert without fear of contradiction by those who have performed the operation, that so much as is here described to have escaped, will never be lost through an opening in the cornea, the remaining part of the operation being confined to the division of the iris and crystalline lens; and, as it is acknow-

ledged that the loss of half the vitreous humour is not followed by unpleasant consequences, the objection if correct, is after all, of little weight; and, I am satisfied that in most instances, the quantity lost will not be greater in one operation of this particular kind, than in the other ; and the objection is at least, equally applicable to both operations.

In consequence of the loss of the vitreous humour, he conceives, that atmospheric air will be admitted into the posterior cavity of the eye ball, and give rise to violent inflammation and suppuration, terminating in a total destruction of the organ. This occurrence he considers more likely to take place in Maunoir's operation, than in his own, and advances it accordingly as an objection to the operation. Bëer and the continental surgeons in general, are very much afraid of the admission of air into any of the cavities of the body, but in Great Britain, surgeons do not dread it, provided the parietes of the cavity be in a natural and healthy state; and in regard to the eye, it is manifest, that when an opening is made, so that the vitreous humour runs freely out, and the coats of the eye collapse, there must either be a vacuum formed within the eye, or some atmospheric air must take the place of the humours ; for the term collapse of the eye is only a figurative expression. I do not see that any other inference can be drawn, and as the state of collapse is the

same in both cases, it may be fairly concluded, that the state of eye in regard to the presence of atmospheric air, is pretty much the same in both instances; but, as the question admits of decision by matter of fact, it is unnecessary to refer to opinion, and as no other person will assert that the operations of Maunoir and Scarpa with the scissars, have been more frequently followed by suppuration, than those which have been done by the knife, it is evident, that until this assertion be proved, that neither of the objections are of any force. So far indeed from a dissolved state of the vitreous humour, being likely to lead to suppuration of the eye, after an opening has been made in the cornea ; it appears to me, that the reverse is nearer the truth, and that this accident is more likely to occur when the vitreous humour is sound; for, we know that operations for cataract, are much more frequently followed by inflammation and suppuration, if a small portion of healthy vitreous humour be protruded, and in part retained between the edges of the incision, than if a greater quantity in a more fluid state be lost. In such cases, it is not the admission of air, which causes the mischief, but the propagation of ulcerative inflammation from the edges of the cornea, which ought to have united by the adhesive inflammation. The admission of air then, I consider as equal, in a surgical point of view, on both sides.

To the 2nd. objection. That considering the permanency of the two kinds of pupils as equal, still the preference is to be given to the shape, size, and situation of that made by the knife, I fully agree; and in a case where both operations may be performed, in other respects indifferently, I prefer on this account, the operation, with the knife.

The 3rd. objection, is, that if the lens or capsule, be very hard, indurated, or ossified, a delicate pair of scissors cannot divide them. "In this case, he says, they must be extracted whole and entire, which will occasion not only a considerable degree of injury to the iris, by the separation of the adhesions existing between them, and by forcing the lens, through the newly formed pupil; but the cornea likewise will require to be opened, full one half of its circumference, as in the common operation for extraction of the cataract, in order to admit of their free passage. Now it must be obvious, that the danger of a copious escape of the vitreous humour, even should it be in a healthy state, is here very great, while if it be in any degree disorganized, its total discharge, and a consequent loss of the organ, is inevitable."

A reply to this objection, can only be made by acknowledging, in the first instance, the difficulty in its fullest extent in an extreme case of this kind; and then, by enquiring, how

the difficulty would be lessened, by instituting in the place of the scissars, the knife; and to this enquiry, no man of any experience will reply, otherwise, than that the difficulty instead of being lessened, is infinitely encreased; and that although the chance of success with the scissars, be small, there is hardly a probability of it with the knife; and in some cases, as where the iris is convex, the knife cannot be used, whilst the scissars are yet applicable.

Supposing that the scissars are too weak to divide the lens, which is but a gratuitous supposition, never actually realised in practice; it is difficult to conceive what the knife can accomplish, indeed it is utterly impossible that it can make any impression where the scissars have failed. Supposing, however, for the sake of argument, that the knife can be brought in front of the iris, it may be made to make a mark upon it; but, where the indurated capsule and lens adhere so firmly, as is presumed to be the case, it cannot separate them; admitting still, that after great labour and repeated efforts, during which, the dissolved vitreous humour runs out, the hardened and ossified lens and capsule are separated, what is to be done with them? are they to be left to roll about in the cavity of the eye? or, are they to be pushed through the newly formed pupil, and extracted? If left to roll about, the eye must indisputably be lost, according to Sir W. Adams's own doctrine,

and according to fact, in such cases. As to partially detaching a hardened lens, it is out of the question; for unless it be removed from the iris, the operation is unavailing, and will end in the destruction of the organ. A capsule may perhaps be depressed, and a shrunk lens may be superadded to it; but, a hardened lens, and indurated capsule, adhering in the manner described, cannot be so treated; and if they could, the irritation of them would prove destructive, as it invariably does, in every case of imperfect depression, or couching, as Sir W. Adams has proved in his objections to that operation. As to extracting them, as Sir W. Adams recommends, it must be accomplished with less probability of success, than if the cornea had been opened, as the first step of the operation; indeed the whole of the third objection to the use of the scissars, applies to the use of the knife, and in a much stronger manner, for, it is one operation superadded to another, and the patient has to encounter the dangers of both. The same injury must be sustained, from separating the adhesions to the iris, and forcing the lens through the newly formed pupil, the same sized incision must be made in the cornea, and the danger of the escape of the vitreous humour, must be as great, unless it has already run out. In investigating then closely, the operations recom-

mended by Scarpa and Sir W. Adams, and the arguments advanced on both sides, the only essential difference that I can perceive between them, in a case of hardened or ossified lens and indurated capsule, is, that by the double operation of Sir W. Adams, an additional wound is inflicted on one of the most delicate parts of the eye, and a greater liability for inflammation and suppuration incurred, than, if one operation alone had been attempted; and this without any evident advantage. I apprehend then, that although the scissars be bad, the knife is a great deal worse, and that if an operation must be done by either, the scissars are infinitely to be preferred. In such cases, the continental surgeons recommend the coredialysis, and I believe they are often correct in their recommendation.

If scissars be used, in any case, the operator should always endeavour to make his pupil, on that side of the centre of the eye, which is opposed to his incision in the cornea. In using them, the salient angle at the joint, or the convex side of the scissars should be upwards, the patient always being placed on his back. There is an inconvenience however to which scissars, as they are usually made, are liable, and that is, they bruise rather than cut: this Mr. Stodart has endeavoured to obviate, by giving to each blade, at the suggestion of Dr. Wollaston, a lancet edge; so

that they divide the part without bruising, and with great precision. I have used them upon the iris, and as they cut with more facility than the common scissars, I subjoin Mr. Stodart's statement of the alteration.*

If the lens has been removed or absorbed, the closure of the pupil may be accompanied by an unusually thickened state of the capsule. If the capsule should adhere strongly to the iris, it will be cut with it, as I have already mentioned, and its edges must be pushed asunder, and any portion of the capsule which may be detached, carried forward into the anterior chamber. If the capsule be less firmly adherent, it must be detached and brought forwards, or, separated from above and depressed below the lower edge of the pupil, where it will ge-

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* The scissars are made with knife edges, which is a valuable improvement, the customary edge of the scissars being at an acute angle, and the cut is always attended by more or less compression and bruising of the parts; it is partly on this account, that scissars are so seldom used in surgical operations, the wound being by this compression, prevented from healing by the first intention; with the new scissars, this objection is completely obviated, the cut is as neatly made as with the knife or lancet. In the operation for hair lip (especially on the child,) the knife edge scissars are decidedly preferable to all other instruments; the improvement was proposed to me by Dr. Wollaston.

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nerally remain; or if it float a little at first, it will soon shrink, and disappear from the axis of vision.

If the capsule be but slightly attached to the iris, and still thin although opaque, it will be sufficient to lacerate it in every direction, opposite to the artificial pupil, and the remnants will in like manner, disappear.

If the capsule on the contrary, remains in its natural situation, and is much thickened, an attempt to lacerate it will not succeed; if it be detached from above, after much trouble, it will not remain depressed. The best thing the operator can do after having made the artificial pupil, is to endeavour to separate the central part from all its adhesions, and to push it into the anterior chamber; but in these cases, the anterior and posterior portions of the capsule, are frequently united, and resemble a piece of leather, the hyaloid membrane becoming proportionably tough; for although the knife divides the iris, it makes little impression on the capsule, which will not tear, if it be carried even to the very back of the eye, but will spring back the moment the needle is removed from it; the operator will then in 19 cases out of 20, be obliged to defer the operation on the capsule, to a subsequent period, when I have no hesitation in affirming, it will be more readily removed by opening the cornea at once, than by any operation posterior to the iris; for the same

difficulty will again occur, and at last, recourse must be had to evulsion and removal through the cornea. The patient must be placed on his back, and the external part of the cornea opened for near one fourth of its extent, but where the transparent cornea is large, one fifth will be sufficient; for if room be not given for the easy introduction of the instruments, the irritation in passing them in, will be the cause of a greater subsequent opacity of the cornea, than the mere size of the incision can possibly be, whilst the chance of a protrusion of the vitreous humour, will be rather diminished than increased; for if the opening be sufficiently free, the flap rises, and there is no pressure on the ball of the eye; but if the opening be confined, it is the sclerotica that yields, and the vitreous humour is compressed. Two instruments ought now to be at hand, a small but sharp hook, and a pair of spring forceps, serrated within the points. I generally first employ the hook, by passing it into the pupil and under the capsule, which being pierced upwards, is to be drawn, steadily but not forcibly out of the eye: sometimes it will yield, and the operation is almost immediately completed; at others, it may be drawn just without the cornea, and its attachment divided with the scissars, or it may be so tough that the hook will not take sufficient hold, and slip, or, bring away only a piece. I then try the forceps, which are to be

introduced closed, until they reach the capsule, when the blades are to be opened, and made to close on as much as possible of the membrane intended to be removed; the spring will now keep the blades together, and prevent the capsule slipping from the points of the forceps, which are serrated within. If the forceps be now drawn out, it is evident the capsule must come with them, but in doing this, the surgeon will sometimes perceive that he turns the hyaloid membrane on its axis, or that he pulls it so much towards him, that the vitreous humour is compressed against the side of the sclerotica and bursts from its cells, a portion being evacuated; for the hyaloid membrane in many cases of this kind becomes exceedingly dense and strong, much beyond what might be conceived from an examination of its healthy structure. The capsule should not then be forcibly torn out, but the forceps turned on its axis, by which means the capsule is wound round the blades of it, the evulsive force is more equally divided on the surface of the whole hyaloid membrane, and is more easily regulated. If this manoeuvre fail, the scissars must be introduced and the attachment divided, as close as circumstances will admit. Proceeding in this way and with due caution, greater liberties may be taken with the eye than could be supposed, and with perfect

safety; for the inflammation, if any follow, is very manageable by simple means.

Sometimes an artificial pupil may be formed, and the capsule not removed, or, an adventitious membrane may close up the opening adhering to the edges of the pupil in every direction. The case resembles that of secondary cataract adherent to the natural pupil. Scarpa's needle is to be introduced, or one a little straighter, such as I have represented in my work on cataract, and the membrane detached every where, except at the internal or lower part; at which spot it must be pushed below the pupil, and if it adheres to the iris, it will shrink up and remain out of the axis of vision. If by accident, it has been totally detached, it will not always do so, and must be pushed into the anterior chamber. If the capsule should adhere more strongly to that of the vitreous humour, than to the iris, it may also rise again, and require another operation. The advantage arising from its retaining an attachment to the iris, rather than to any other part, is therefore obvious.

Lastly. After the operation for cataract has been performed by extraction, the edge of the pupil sometimes adheres to the inner edge of the incision, without any portion of the iris having been protruded; the natural pupil is in such a case, reduced in size to near a small pin's head, and if any opaque cap-

sule remain behind, vision is almost entirely prevented. In some instances of this kind, the pupil although nearly closed, is still dilated by the application of the belladonna at every point, save the one at which it is attached, and nearly in the same manner as it would be, if no such attachment had taken place. In one case which came under my observation, I presumed that if inflammation could be induced in the iris, when the pupil was in a semi dilated state, the consequent effusion of lymph in its cellular structure, would agglutinate the fibres one to another, whilst under the influence of the belladonna, and on this effect ceasing, a permanently enlarged pupil would remain. In this presumption, there was nothing new, for if the belladonna be applied in a case of inflammation of the iris, before the inflammatory action be sufficiently subdued, this permanently dilated state of the pupil may be constantly expected; and if its application be on the other hand, too long delayed, a permanently contracted state of the pupil will be the correspondent result. Of which facts I have instances in the person of a young man now under my care, in whose right eye the pupil is permanently dilated, whilst in the left it is contracted; the reason I have stated, and as he was treated for this disease by a very able practitioner, there can be no suspicion of want of ability in his pre-

vious management. In the case in question, I could not effect artificially, what is not easily prevented from happening naturally, for although I lacerated the capsule, and then punctured the iris in four different and opposing points, whilst in a dilated state, and although I repeated it twice, I could not make it inflame; and the man received so much benefit from the partial removal of the capsule, that he would not let me repeat that, or the common operation of division, which would certainly have succeeded.

General Treatment after the Operation.

THE treatment after an operation on the iris, is of as much importance as the operation itself, and is two-fold; to prevent inflammation; and, to subdue it, if it should occur. If inflammation be allowed to take place, or cannot be prevented, a failure may be expected, and the eye left, in all probability, in a worse state than it was previously to the performance of the operation. As far as my observation has carried me, or as I have been able to obtain information, sufficient attention is not paid to prevention in the first instance, any more than after the different operations for cataract; and inflammation is allowed to establish itself before means are employed for its prevention; an error of very great magnitude, which should be carefully avoided.

According to the principles which have been laid down, the eye ought not only to be in a sound state, exclusive of the closure of the pu-

pil, but the constitution of the patient should be good, and his general habit healthy, before an operation should be attempted. In a case of this description, inflammation may or may not supervene, from the injury inflicted on the iris; but, it is to be expected as the natural result of a wound in the human body, and therefore to be guarded against; for if it should take place, the artificial pupil may be obliterated, by a closing of the divided fibres of the iris, or filled up by the effusion of lymph; whilst the power of vision may be destroyed by the extension of inflammation to the more internal parts. According to the view entertained at present of the human frame, in health and labouring under disease, surgeons are not disposed to resort to violent measures, such as great depletion, purging, or starving, by way of preparation, but merely remove any obstruction, or forbid any irregularity of conduct, which might prove prejudicial if inflammation should occur. The patient is then only placed on low diet, the bowels gently opened, and he is removed from all the exciting causes of irritation for a few days previous to the operation. Blood-letting was formerly resorted to, with a view of reducing the powers of the system, and consequently of preventing inflammation; but the quantity abstracted, was seldom more than a few ounces, and was in my opinion, rather detrimental, than bene-

ficial, exciting, rather than allaying any disposition to irritation, by creating a greater degree of anxiety in the mind of the patient, without having any decided effect on the sanguiferous system. Instead of drawing blood before the operation, (except in plethoric persons,) the surgeon should abstract it afterwards, in a sufficient quantity to have a marked effect on the action of the heart and arteries ; and if it can be done at the moment when the local irritation is about to affect the general system, the advantage of it will be considerably greater. As a general rule then, yet, admitting of particular exceptions, according to the judgment of the surgeon, founded on his knowledge of the human body in health, and under disease ; the patient should be bled largely after any of the operations for the formation of an artificial pupil; and the quantity ought to be regulated by the constitution of the patient, his disposition to inflammatory action, or the appearance of any of the symptoms of inflammation. After all the different operations, the patient feels that something has been done to the eye, although the actual pain on many occasions, is but trifling, and soon subsides, leaving the eye easy, or with some sensation of stiffness; in others, the pain continues more or less acute, does not subside, but gradually gives rise to other concomitants of inflammation of the eye, such as heat, swelling, and increased se-

cretion of hot tears, with an addition of pain not confined to the eye, but extending to the brow and side of the head, demonstrating the presence of, and the rapid increase of inflammation.

The pain in some instances, is severe during the operation, in others trifling; and it is in general, desirable to ascertain whether this will increase or diminish, before recourse is had to the great remedy, bleeding, in order that the quantity to be abstracted, may be regulated according to the idea entertained of the state of the constitution. I usually therefore wait from three to six hours, (unless the pain increase,) before I direct blood to be taken away; which is then done in almost every case, whether for the sake of precaution or necessity, to the amount of fourteen ounces; in some instances, to twenty-four, or from that to thirty ounces. If it be simply by way of precaution, a vein may be opened in the arm; and if from necessity, from the arm and temporal artery, at the same time, or nearly so, in order to produce, with as little delay as possible, a decided effect on the sanguiferous system, and especially on the eye. The first bleeding, when a precautionary one, may be moderate; when a necessary measure, it ought to be effectual; and if syncope be occasioned by the loss of blood, and not by the alarm of the patient, it is so much the better. The pain will not always immediately subside,

although it may be diminished, and will, in a short space of time, almost entirely disappear, proving the efficacy of the means adopted. But if the diminution of pain is only temporary, and after a few hours, begins again to increase, recourse must again be had to bleeding, regulated according to the patient's constitution; and if this should not be sufficient to arrest the progress of the disease, it must be immediately treated as a case of iritis, and mercury administered in such a manner as to affect the system as rapidly as possible. If however, the abstraction of blood has been judiciously directed, recourse to this unpleasant remedy will seldom be necessary; but where unfortunately, the loss of blood is not capable of putting a stop to the inflammation, then the medicine should be administered in doses of two or three grains of the sub-muriate of mercury, combined with one of the pulv. antimon. and a quarter of a grain of extr. opii. every three or four hours, until the mouth becomes sore, or the disease is arrested. A solution of opium, combined, or not, with mercurial ointment, ought to be applied externally, and the whole treatment conducted in the manner laid down in my work on Cataract and Inflammation of the Iris. The eye should be kept dry and warm, and the belladonna only applied when the inflammation has been removed.

On the utility of mercury in cases of idi-

opathic, or symptomatic iritis, so much has been written, that it is unnecessary here to add to it ;* but the great utility of mercury in inflammation of the iris, resulting from wounds, has not, I believe, been either noticed by authors, or generally understood. It is not however, more valuable in one case, than in the other ; and the use of it should never be neglected, when bleeding is insufficient for the supression of the inflammation, which will in all probability, prove destructive to vision.

Local blood-letting by means of leeches and cupping, is not of so much value in active inflammation of the iris, as is supposed ; because the blood drawn, relieves the vessels affected but in a very slight degree, and has no effect on the system at large, unless it be carried to excess, when it is more troublesome, and in that case more detrimental to the system, than general blood-letting. By opening the temporal artery, I consider that I am relieving locally, as well as generally ; and therefore this method of abstracting blood, is greatly to be preferred. The application of a dozen leeches sometimes does good, but not in my opinion, in a degree equal to the trouble attending them; and to make them answer more effectually,

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* See especially, Saunders on the Diseases of the Eye, edited by Dr. Farre, and Mr. Travers's Essay on Iritis, in Cooper's and Travers's Surgical Essays, part 1st.

I frequently apply the cupping glasses over the bites.

During the first period in which we are endeavouring to prevent or reduce inflammation, recourse may be had with great effect, to the antimonium tartarizatum, in nauseating doses, one drachm of the liq. antimon. tartar. or 1-8th or 1-4th of a grain of the powder, may be given every hour, according to the susceptibility of the patient, so as to cause considerable nausea, or even at first, a slight vomiting, when the dose must be diminished; for as to excessive vomiting being serviceable in active inflammation of the internal, or more important parts of the eye, or even the ophthalmia, improperly called Egyptian, it is, to say the least of it, an error. It has done harm in every fair case in which it has been tried; and the surgeon who wastes that time so precious to his patient, in the use of means so totally inadequate to effect a cure, will have reason to regret his deviation from the beaten paths of sound medical science.

After the great inflammatory symptoms have subsided, leaving however, a considerable degree of irritation, blistering on the nape of the neck, and the other usual means recommended in cases of inflammation of the iris, will be found of great service.

In directing blood-letting as a general remedy in all cases of operation, in which the consti-

tution of the patient does not forbid it, I have been also very much actuated by the circumstance of inflammation, sometimes running on even to suppuration of the internal parts of the eye, without causing so much pain, as to attract particular attention. Richter gives an instance of this kind, and I have also seen one of the same nature, rendering it then absolutely necessary not to trust to the non-appearance of symptoms, especially in those cases where precautionary depletion cannot with propriety be resorted to; but to examine the eye from the first day of the operation, and carefully mark any appearances on the conjunctiva, particularly those indicative of chemosis. If inflammation be present, we acquire in the certainty of it, a knowledge of the greatest importance, and if it be absent, the gentle raising of the lid in a moderate light, sufficient to enable us to ascertain the fact, can never do any mischief.

I am the more particular on this point, because the fact is not generally known, and is therefore frequently overlooked by those who consider pain as the essential sign of inflammation.

If the cornea should have been opened, and some degree of opacity ensue, a solution of the argentum nitratum, beginning in the proportion of four grains, to the ounce of distilled water, and encreasing it to eight, ten and twelve

grains will be found, as well as the other applications usual in such circumstances, of essential service in removing it.

If the patient should some days after the operation, suffer from an attack of erysipelatous, rheumatic, unhealthy or other inflammation of the eye or iris, it must be treated as an idiopathic or symptomatic case of the same nature, occurring independently of the operation.

During the first days of the treatment, the patient should be confined to bed, the eyes lightly covered, so as to exclude the light, and the diet be strictly antiphlogistic; but as soon as all danger of inflammation is past, the eye may be gradually accustomed to the light, the shade left off, and the patient allowed to return to his usual habits.

If the iris has become more vascular than usual, a greater or less quantity of blood may be effused, especially in the operations by excision, or separation, which will in general, be absorbed; but if it be in greater quantity, puncturing the cornea, and evacuating it and the aqueous humour, will rapidly tend to remove it. In a complicated operation, such an occurrence may prevent its completion.

The power of vision resulting from the different operations, must of course vary exceedingly, both as regarding the state of the eye, and the particular method of operating.

After division of the iris, the patient must wear a cataract glass, on account of the lens having been removed. After excision, this is not always necessary, and the patient recovers good sight without it; although in the first instance, a convex glass will be useful, and where the pupil is made towards the margin of the iris, will be absolutely necessary, until the retina has become accustomed to the unusual stimulus of light. The same thing occurs after the operation, by separation from the ciliary ligament, but in many cases, the retina will be found nearly insensible in the first instance, and only slowly recover itself. In one case in which I operated after the patient had been twenty-four years blind, he saw immediately after light was admitted to the retina, and wrote me a letter a very few days afterwards. In another case, after twenty years of blindness, the patient has recovered so as to walk about with ease, but he can only just discover the large letters of a printed book. In some instances, the first admission of light gives pain, whilst in others, it excites only pleasing and joyful sensations.

SECOND CLASS.

Those morbid states of the eye which depend on derangement of the structure of the cornea; the anterior chamber being nearly or quite natural in its dimensions, the iris, the crystalline lens and its capsule being healthy.

SECTION *a*.

Those cases in which the cornea is rendered partially opaque, (leucoma) in consequence of ulceration, operation, or other cause, preventing the transmission of light, or, impeding it so much as to render vision indistinct; but in which the anterior chamber the lens, and its capsule remain unimpaired.

THE nature of the case is explained in the description already given; it is a derangement of the cornea alone, the consequence of ulceration, or cicatrization in almost every instance; although it occasionally occurs from a deposition of lymph between the lamina of the cornea, which has become organized; the opacity not admitting of removal in either instance, and occupying so much of the centre of the

cornea, as to prevent the passage of the rays of light to the retina, rendering vision exceedingly defective, and for the most part useless, the patient only seeing in an imperfect manner sideways, and generally receiving considerable benefit from the application of the belladonna, so much so, as in some instances to induce the sufferers to decline any operation.

This is the most favorable case, for the operation of excision, and in no instance should any other operation be attempted. The principle of it, is to make an opening in the cornea; through which the iris may immediately protrude, and be readily cut off, which may be effected with almost a perfect certainty of success, by attending to the following directions.

The patient is to be placed on his back, and the eye lids secured by the fingers of an assistant, an opening is then to be made in the most favorable part of the cornea, with a cataract knife, or other sharp instrument, immediately before the junction of the cornea and sclerotica, and at a sufficient distance from the iris, which is to be carefully avoided. This opening ought to be nearly three lines in extent, and made with a rip, so that the aqueous humour may be suddenly evacuated and bring a portion of the iris with it, which it will almost invariably do. This portion is to be

seized by the forceps, and cut off by the scissars, when the operation is completed.

In making the opening in the cornea, I generally attempt a complete punctuation by not using too broad a knife, by which I avoid accident from the point of the instrument, and prevent the escape of the aqueous humour, but with a sudden gush; but I by no means consider it as actually necessary, for the knife may be introduced by a steady hand, and made to cut a sufficient portion of the cornea in the same manner, or with a rip, without making the punctuation.

[a] Mr. Gibson says, "all pressure is now to be removed from the eye ball, and the cornea knife gently withdrawn. The consequence of this is, that a portion of the aqueous humour escapes, and the iris falls into contact with the opening in the cornea; and closes it like a valve. A slight pressure must now be made, upon the superior and nasal part of the eye ball, with the four and middle fingers of the left hand, till at length by an occasional and gentle increase of the pressure, or by varying its direction, the iris gradually protrudes so as to present bag, of the size of a large pin's head."

[b] Sir W. Adams says, "on withdrawing

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[a] Gibson on Artificial Pupil, page 40.

[b] Sir W. Adams on Artificial Pupil, page 44.

the point of the knife, the aqueous humour escapes, and the iris and cornea come into contact with each other. If the iris does not spontaneously protrude, which it usually does, the assistant should make a slight degree of pressure upon the eye ball, for the purpose of occasioning it to do so."

By making the opening in the cornea, in the manner I have recommended, I will venture to say that the iris will almost invariably protrude, and without the slightest danger, and nearly in a sufficient quantity for excision, unless it have some internal attachment. If the iris should not protrude, pressure must be made as directed by Mr. Gibson, with gentleness and caution (lest the capsule of the lens be ruptured, or the lens displaced,) until the iris appears between the edges of the opening in the cornea, when it is to be seized by the blunt round ended forceps, and drawn out with equal care, until a sufficient quantity be protruded, so that the edge of the natural pupil may be included in the incision. This however can seldom be judged of, but from the size of the portion of the iris which is protruded; for the cornea being flaccid and in part opaque, and the iris irregular from the protrusion, the edge of the pupil cannot always be distinguished, especially if it happen to be just at the edge of the incision: and time would be badly spent in making

search for it; for if the protruded part be of the size of a large pin's head, the edge of the natural pupil is almost to a certainty included, and to some extent.

In every case of this kind where the iris is free, it may be made to protrude by the measures directed; but where the iris is attached, it may be necessary to use the forceps, or hook, or resort to the methods recommended in the different sections in the third class.

In his last publication, Sir W. Adams claims the merit of an improvement, for directing the edge of the natural pupil to be always removed, and attributes to Mr. Gibson's operation, the defect of "causing the patient to have two small pupils; namely, the remaining portion of the natural pupil, and that which has been newly formed." At page 90, he makes a reference to Mr. Gibson's work, which he thinks demonstrative in his favour, but he has not quoted the whole passage, which is as follows, page 40.

"It sometimes happens that the whole breadth of the iris, to the border of the natural pupil, is protruded, and removed in this way. This I consider as rather an advantage, because it insures a large pupil, though generally one which is oblong in its shape. I have found however, the mere circumstance of shape, to be of little consequence in this operation; and always to be sacrificed to the object of

size. It may also be remarked, that the opening has no disposition to close, when in forming the artificial pupil, the border of the natural pupil is divided."

"It occasionally happens, also, that as soon as the knife is removed, the muscles of the eye ball act with violence, and project a small staphyloma, or bag of the iris through the incision. If this bag be not large enough to form the new pupil, the iris must be further protruded by gentle pressure."

At page 47, he says "the permanency of the artificial pupil appears to me to depend, principally, upon the size of the opening, and healthy state of the iris, and contiguous parts of the eye, at the time of the operation. When the artificial pupil has been made almost as large as the medium size of the natural one, and especially, when the part of the iris removed has included its border, I have never seen any disposition in the opening to close. When, however, a more narrow slip has been removed; when the iris, from previous inflammation, has become more vascular than natural, or when it is complicated with adhesion to the capsule of the crystalline lens, in such cases, its closure has occasionally taken place."

In the case of Captain F. page 61, in which the iris was adherent, so far from being content with a small pupil, he says "a degree of pressure was then made, in the manner

already described; but only a small bag of the iris could be protruded, which was cut off with the curved scissars. The hook was next introduced flat, and with its point downwards, until it laid hold of the inner rim of the iris, which was gently drawn out in sufficient quantity to be cut off by the curved scissars. The new aperture thus formed in the iris, was irregular in shape, but formed an excellent artificial pupil."

I consider it demonstrated from these passages, and particularly the last, that Mr. Gibson wished the edge of the natural pupil to be removed whenever it could be safely accomplished, in the opinion of the operator; he did not recommend it always to be done, because he knew it could not always be effected, when it was not free; and so far from the principle of his operation, tending to the formation of two pupils, I have no hesitation in saying, that in my opinion it is precisely the reverse. I admit that in certain instances, two pupils may be formed; and that in some of Mr. Gibson's cases, two pupils were formed; but this occurred from the inner edge of the iris being strongly adherent; and consequently not capable of being protruded either by pressure, the hook, or the forceps. The error was not so much in the mode of doing the operation, as in adopting it in a case to which another was more applicable. The fault is not then

in the operation, but the operator; Mr. Gibson stands precisely in the same situation as Mr. Cheselden. They both invented or practised operations highly successful in certain cases, but which, when resorted to indiscriminately, were found frequently to fail, and were either undervalued, or hastily abandoned.

It is not even just to attribute the merit of this operation to Mr. Gibson, for although I firmly believe he was not acquainted with Professor Bëer's mode of operating, there cannot be a doubt that Bëer opened the cornea, drew out the inner edge of the iris with a hook, and cut it off with scissars, whilst Mr. Gibson was a student. Still the operation was made known to us in this country, by Mr. Gibson; and he used both the hook and forceps; the latter being made with a spring and handle. Professor Walther, late of Landshut, did also in 1815, inculcate the same doctrines.

The only addition made to the operation, since the time of Mr. Gibson, is that of using a pair of common round pointed forceps, with a handle attached to them, for drawing out the iris, instead of the spring forceps or hook, which he recommended; and the operation performed in the manner directed, is the safest, whilst it is at the same time, the most simple that can be done on the eye, for the attainment of so important an object as the formation of an artificial pupil.

THIRD CLASS.

Those morbid states of the eye which depend on any combination of the two preceeding states of disease, or with a diminution of the anterior chamber of the aqueous humour.

SECTION *a.*

A slight attachment of the iris, drawing the natural pupil to one side, with diminution of its size, the lens and capsule being transparent, the cornea opaque at the point of attachment.

SECTION *b.*

The same with opacity of the lens and capsule.

THESE varieties of disease are the result of inflammation, which has terminated in ulceration or sloughing of the cornea, but principally the former; and occurs for the most part in the more acute or chronic forms of disease; the ulceration which gives rise to either, being of the acute kind; and when occurring in a chronic case, is in general the consequence of its becoming changed, through the application of some irritating cause, which gives

to the inflammation, an activity it did not before possess, and which the powers of the part are unable to sustain. The appearance or nature of the ulceration seems to depend much upon the activity of the inflammation, and the relative power of the part; which also regulate, in an equal degree, the healing process; and the nature of the ulceration frequently determines the nature of the derangement of the iris.

Independently of other peculiarities, I have been able to observe three leading points of distinction in ulceration of the cornea, as connected with attachment of the iris to the cornea.

Where the ulceration proceeds deep into the substance of the cornea, (however it may originate,) bearing the true characters of an active ulcer in other parts; and filling up, by the deposition of lymph, and cicatrization of the part; leaving an indelible opacity or scar.

Where the ulceration possesses a certain degree of activity; but instead of penetrating, like the former, in a hollow, cup like manner, spreads more extensively, removing only one or two of the outer lamina of the cornea; and healing with a slight muddiness of the part, through which the colour of the iris is perceptible. In the circumference of the cornea, this kind of ulceration, after the activity of acute in-

flammation has been subdued, often assumes at a late period, the form of a groove; the discharge being frequently ichorous.

A chronic kind of ulceration, sometimes beginning acutely, in which the superficies of the cornea seems to be sliced smoothly off, giving to that part, the appearance of a gem which has been cut by the artist; and which cut surface frequently remains for months unaltered, impairing vision from the different refraction of light, but not on healing becoming opaque. In young persons, sometimes, indeed frequently, regaining the natural level of the cornea, without causing any opacity.

The morbid state of the iris in question, is one frequent result of the two first kinds of inflammation, seldom or never of the third. In children, and young persons of a strumous habit, inflammation of the membrane lining the inner surface of the cornea, said to be reflected over the iris in a more attenuated state, frequently gives rise to the appearance of a lardaceous ulcer on the cornea, in the same manner, I conceive, as irritation of the urethra, or of the rectum induces abscess in perinæo, or by the side of the gut, constituting fistula in ano, without any continuity of ulceration, until, after the external part has yielded, and the ulcerative process has extended inwards. This ulcer does not commonly penetrate the cornea,

even if neglected, but fills up, in some cases, by the deposition of lymph; in others, by leaving an opaque flat surface; it may, however, penetrate through all the lamina of the cornea, as far as the inner membrane, which protrudes through the opening, giving rise to what is termed a protrusion, or hernia of the the membrane of the aqueous humour, or ceratocele. This protrusion may in general, by proper treatment, be forced to recede, without bursting; it occasionally however yields, the aqueous humour is evacuated, and the iris more or less drawn into the opening. If the case be very successfully treated, the iris will appear, (after the ulcer has in part filled up, and the anterior chamber been re-established,) to point towards the ulcer, as if attached by a thread, which pointing, or elevation of the iris, will slowly recede to its natural state, without leaving any irregularity. But, if the ulcer should have made greater progress, the iris will adhere to the cornea at that part, in a greater or less degree; and the pupil be distorted, as well as considerably diminished in size, although the lens may remain uninjured.

In adults this alteration of structure is principally caused by ulceration, the consequence of active and violent inflammation; whether indiopathic, purulent (ophthalmo blenorrhœa of continental authors) or gonorrheal, and is preceded by the formation of matter, or

sloughing of the cornea. It is not often observed as a consequence of rheumatic inflammation, where the pustule preceding the ulceration, more commonly contains at first an ichorous fluid and the ulceration is superficial. It is by no means an infrequent occurrence, in cases of chronic inflammation, in which the cornea has become yellowish, soft, and vascular: or the conjunctiva of the tarsus is in a state of disease, and especially if an acute attack of inflammation supervene from exposure to cold or other exciting cause. I have at this moment four well marked cases, of this disease under my care, in two of which I have been able to prevent the extension of the ulceration, which in the other two had penetrated the cornea, and caused a protrusio iridis, before any assistance was required. If the danger be imminent, the argentum nitratum cut to a fine point and applied so as at one momentary touch, to fill up the hollow of the cuplike ulcer, is the best remedy; it destroys the undue action attendant on ulcerative absorption, leaving it often at that degree of intensity only, which constitutes the adhesive or healthy inflammation, after which the repeated application of the vin. opii. and other mild stimulants will effect a cure, often with a very small cicatrix. Where the danger of protrusion is less imminent, a solution of the argent. nitr. gr. x. aquæ rosæ ʒ j applied

by a camel's hair brush, with the vin. opii. will be often sufficient; and in many cases less urgent, the vin. opii. will alone effect a cure, provided the general undue action has been diminished.

When the protrusion has taken place, the ulcer must not only be healed, but the original disease cured before an operation to relieve the iris can be thought of, and the nature of it must be regulated, by the extent of the leucoma of the cornea, attachment of the iris and dilatation of the pupil, as well as by the state of the lens and its capsule, which may have become opaque from continuity of inflammation.

When the iris is only attached by a point, and vision considerably impaired, the lens remaining transparent; a small cataract knife should be entered at the external edge of the cornea, carried across the anterior chamber to the spot where the iris adheres, in order to cut it across by a gentle motion of the knife forwards, if the case will admit of it, so that the aqueous humour may not be evacuated, until its division be completed, when the knife is to be quickly withdrawn. The pupil relieved from the restraint under which it laboured, will now be dilated by a slight application of the belladonna, the aqueous humour will be replaced in two or three hours, and the small portion

of the iris remaining attached to the cornea, will gradually disappear. If this separation of the attachment of the iris to the cornea should not be found effectual, a larger opening must be made in the cornea, a pair of scissars blunt at both points, introduced, and the edge of the natural pupil divided towards the nose, so as to enlarge it sufficiently for the purposes of vision, the operator being particularly careful not to injure the capsule of the lens, or, if there be an opacity of the cornea at that part, the outer edge of the iris must be drawn out with a blunt hook and a part cut off. In most cases however, where the pupil cannot dilate, on the removal of the attachment, the inflammation which caused the deposition of lymph in its structure, so as to prevent its natural motions, will in all probability, have extended to the capsule of the lens, when the operation by division must be resorted to, as in section *a* of the first class; but then the attachment to the cornea should not be divided, in the first instance, as it will facililate the division of the iris, from the resistance it offers to the knife.

SECTION c.

When the iris is convex, but not adhering to a transparent cornea, the pupil nearly closed, the pupillary edge of the iris firmly adherent, the anterior chamber considerably diminished, or nearly destroyed.

THIS state of eye is not very common, because it depends, or seems to depend on causes which are not usually present; and of these, in an especial manner on a perfect closure of the pupil, either by its contraction, or the addition of some substance, which completely closes up the communication between the anterior and posterior chambers of the aqueous humour. From this account of the principal cause, it will at once be evident to those who are conversant with the disputed or doubtful points of the Anatomy and Physiology of the eye, that I am disposed to consider the greater portion of the aqueous humour to be secreted in the posterior chamber, rather than in the anterior chamber; and that the inner membrane of the cornea, usually denominated the membrane of the aqueous humour, does not entirely deserve that appellation. But upon this point, as well

as on another equally disputed, viz. whether it gives a covering to the iris, or not, it is unnecessary to enter here; it will be sufficient to say that Ribes appears almost to have demonstrated that neither opinions are correct. That Professor Himly believes the aqueous humour to be secreted behind the iris ; and that the mode of operating, founded on this opinion, has proved successful. Vide observations, page 92.

The aqueous humour being poured into the posterior chamber, necessarily passes through the pupil, to get into the anterior chamber; and a constant change is going on, from the motion of the iris, which is perpetually moving in it whilst we are awake, and the eye is exposed to the light. When the pupil becomes closed from inflammation, the communication may be altogether cut off, or an opening sufficient may be left to allow of the passage of this aqueous fluid, although not very discernable by the eye. In the first case the iris becomes convex from the aqueous humour collecting behind it, and pressing it against the cornea. In the second, it retains its situation, in consequence of the communication keeping up sufficient pressure on both sides of this membrane.

This explanation does not however, account for the commencing convexity of the iris, which can often be observed, when the pupil is certainly not closed, and where the posterior

pressure cannot be supposed to exist; and in other instances the pupil appears to be so thoroughly closed by an adherent opaque lens, that it can hardly be supposed to be pervious even to water, yet the iris preserves its natural position, and the anterior chamber contains the usual proportion of fluid. If on the other hand, the aqueous humour be supposed to be secreted by the membrane lining the cornea, the difficulties are not diminished, for it is necessary to account for the non-secretion of the fluid. If the cornea be punctured and the aqueous humour evacuated, the contents of the eye are pressed forward by the recti muscles, the iris becomes convex, and lies against the inner surface of the cornea, but the secretion of the aqueous humour goes on, and in less than three hours the anterior chamber will again be full. Let this operation be performed from the sclerotica, either in the attempts to make an artificial pupil, or to cut up a cataract, the lens in both instances being loosened in its capsule, so as to press on the iris; the result of almost any number of hours will be different. The iris will become convex, as in the former instance, yet no more fluid will appear in the anterior chamber, the iris will not fall back, but remain convex. The difference is dependent on the state of the lens; if it be hard, its pressure on the iris will cause it to inflame and

the cornea to slough at its circumference. If it be very soft, it may remain and be slowly dissolved, with only a moderate degree of inconvenience. If the operator should be so unfortunate as to meet with a hard lens, in a case of this kind, he must re-introduce a needle and depress it; there is no alternative. But why is not the aqueous humour secreted, as in the former case, during the first three hours in which no inflammation takes place? If the lens be cut up, this does not occur, neither does it if the iris be divided, and the lens remain whole.

Be the cause what it may, practical observation has taught us, that if an opening be made in the iris, so as to re-establish the communication between the two chambers, the iris will in general fall back to nearly its natural situation, provided the posterior chamber has not been destroyed by inflammation, in which case the eye will frequently be so much disorganized, as to be useless. The operative process for the relief of this kind of derangement, may be of three kinds. First, by depressing or cutting up the lens, and making an artificial pupil, or secondly, by opening the cornea, making an artificial pupil, and removing the lens. Thirdly by the core-dialysis. Himly is the inventor of the first. Demours of the second, supported by Mannoir and Scarpa. The later German authors of the third.

The two first methods of operating in the pure case described, in which the cornea is transparent, are both good; the first making however, a central pupil, the other a lateral one. The first should be particularly regulated by the appearance of the iris, and the cause of the closure of the pupil. If the lens be supposed to be hard and strongly adherent, it is liable to accident in the detachment and removal, causing inflammation, and possibly suppuration or amaurosis; independently of a second operation being always required to enlarge the pupil. In such a case, I conceive the second or third methods the more eligible. If on the contrary, the patient be young, the iris healthy, the pupil of a line in diameter, and the lens in all probability soft, and attached through inflammation of no distant occurrence, the first or Himlyan method should be had recourse to. The needle, sharp at both edges for a short distance, is to be entered as for the depression of the cataract, and insinuated between it and the iris, and in this manner the lens is to be detached; or if too adherent, the point of the needle must be passed at the external side between it and the iris, so as to open a channel of communication; and if possible, a part of the texture of the lens is to be broken up; this will, in cases which have been properly chosen, be generally accomplished, although

with more or less difficulty, and some of the separated portions be absorbed, so that by a second operation, the pupil may be opened a little more. The iris in these cases, is not very sensible, except the disease has occurred from specific or unhealthy inflammation, and the subsequent symptoms are not very acute. If by these operations, the iris has resumed more or less of its natural appearance, although the pupil has not been sufficiently re-established, the opening may be enlarged by the usual operation by division, as in other cases of the same kind, the principal complication having been removed.

When the second method is adopted, the operation practised by Demours, page 20, may be attempted, if the lens is supposed, from the appearance of the iris, to be small; or if an opening made, in this manner, does not appear likely to be sufficient, the more serious operation of Maunoir and Scarpa should be attempted, and there will be much less difficulty met with, than might have been expected, in passing the blunt pointed blade of the scissars between the iris and cornea, provided the external opening has been made sufficiently large.

SECTION *d.*

The state last described (c) combined with opacity of the cornea, and attachment of the iris, including the natural pupil.

IN the former section, the operator had a choice of three operations, all of which, in many cases, were applicable to the state of derangement, although in several, one or other of them might be found more eligible. The attachment of the central part of the iris to the cornea, and the probable opacity of the cornea at that part, as in the present instance, makes an essential difference in the state of derangement, and in the method of operating. The operation usually recommended in this country, as far as I have been able to learn, has been that of excision, (Corectomia,) but it does not appear to me to be always the most applicable. The central division of the iris by the knife, would be of course useless, if practicable, and the operation by the scissars, is not likely to be much more successful. It is a case in my opinion, peculiarly adapted for the operation of separation at the ciliary ligament, for a pupil may be made opposite the transparent part of the cornea, as large as it will

permit, to be useful, and the incision being made in or near the opaque part, will add nothing to the opacity, whilst the strangulation of the iris in the wound, will add little to the opacity or deformity. Mr. Gibson has noticed this state of eye, in recommending his third method of operating by excision, which consists in opening the cornea, and separating, or cutting across the adhesions of the iris to the cornea, with the knife, at the same time the incision is made in the cornea, and then drawing out the iris, a portion of which is to be cut off with a pair of scissars. He says, page 66, "The point of the cornea knife is to be passed through the cornea in the usual way, and is to be directed to those adhesions, the division of which will most effectually tend to render the iris free, for the subsequent part of the operation. Care must, at the same time, be taken to avoid undue pressure upon the eye ball, that the aqueous humour may not escape before that object is accomplished; for otherwise the cornea, and the adherent iris will become flaccid, and the adhesions be much more difficult to separate."

"Having separated some part of the iris from its connection with the cornea, and consequently made an aperture in it, the next step will be to remove a portion of it, in a convenient situation. If the iris appear sufficiently loose, the hook may be first introduced

through the puncture in the cornea, and a gentle attempt be made to draw out a sufficient portion from the eye, to be cut off with the curved scissars. If this be found impracticable, the iris must be removed, within the eye, by means of the iris scissars."

"In using these small scissars, they are to be introduced shut and flat, through the aperture in the cornea; and at the place where the artificial pupil is to commence, a small opening is to be made with them, in the iris. Through this opening, the blade of the scissars, which is attached to the long handle, and has a blunt point,* is to be conducted between the iris and crystalline lens, by opening the scissars a little. The other blade is to be passed between the inner surface of the cornea and iris, until their points reach a little beyond the border of the iris, where it has been separated from its adhesions. This portion of the iris is then to be divided, and the flap thus formed, may generally be removed by another snip or two with the scissars. By this means an artificial pupil of a triangular or oblong shape will be made, which may easily be enlarged by the use of the scissars, if it should appear too small."

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* When an opening has been formed in the iris, previous to the introduction of the iris scissars, it will be advisable to use a pair blunted at both points,

" To the permanent success of this operation, I always consider it of consequence that a portion of the iris should be removed. For although the mere division of the iris, appears to afford a sufficient aperture during the operation, yet this is only temporary, since it arises from the aqueous humour having been evacuated, by which the lens and vitreous humour lose their support anteriorly, and are pressed forwards so as to distend the new opening. Hence it happens that the edges of the iris frequently return to their former situation, when the eye ball has become plump; especially if the border of iris has not been divided. The only case in which I now depend upon a simple division of the iris, is where this membrane, after the operation for extracting a cataract, has formed a large staphyloma, and has, in consequence, been enveloped by the incision of the cornea to such a degree, that during the healing process, the uppermost part of the pupil is at length dragged down, to the lowest part of the cornea. By this means all useful vision is destroyed, and the iris is put upon the stretch. When, in such a case, an horizontal incision is made in the iris, the aperture will remain permanent, because its fibres had previously received all the extension of which they were susceptible."

" It occasionally happens in this operation, that particular circumstances, may induce

the surgeon to postpone its completion. If for example, an attempt to draw out the iris with the hook should prove ineffectual, and the division of the adhesions with the iris scissars, should appear in the least likely to injure the lens or its capsule, in consequence of the aqueous humour having escaped; the best plan will be to postpone the operation, until the eye has recovered from the effects of the puncture. The cornea will then be plump, and the adhesions of the iris may be divided more completely by the cornea knife, so that the operation may be safely completed with the iris scissars."

"In cases of this kind, the iris is sometimes more vascular than usual, and the effused blood so much obscures the part to be divided, that the operator cannot act with any certainty. This state of the iris, therefore, furnishes another reason for postponing the completion of the operation, until the absorption of the effused blood has taken place. All attempts, however, in such cases, sometimes prove ineffectual."

After relating a case illustrative of his manner of proceeding, he adds, "Although the iris was drawn out with the most perfect ease, in this, and two or three similar cases, yet in the majority of instances, I have been unable to effect this, and have in consequence used the iris scissars."

I have transcribed this statement of Mr. Gibson's, because it is highly honorable to his character, as a surgeon and a man; neither encreasing nor diminishing the difficulties of the operation; and whilst he shews the state of eye to which it is applicable, he endeavours to forewarn the student of the obstacles, which he may have to encounter to a successful issue of it; he also very clearly shews that it was always his intention to remove if possible, the pupillary margin of the iris, and how far, and in what cases, he considered a transverse division of the iris likely to be successful.

In the latter part of section *b*. I have recommended an operation, similar to that just described by Mr. Gibson; but then the iris must only be slightly attached to the cornea, and the separation of this attachment requires little more to be done to effect a competent pupil. In a case of attachment of the iris to the cornea, even at its central part, its external or internal pupillary edge remaining free, the operation by excision, will often, with the help of a blunt hook, be perfectly successful. But, if the whole pupillary margin of the iris be firmly attached to the cornea, the anterior chamber will in general, be considerably diminished; the knife will be passed with some difficulty to the adhesion, which will be increased on attempting to separate them, and cannot always be accomplished. In many

cases, even if effected, the iris will be found very intractable, not readily drawn out with the hook, and if the lens and capsule should not be opaque, the repeated attempts at separating the adhesions, and drawing out the iris, will cause them to become so, and frustrate the operation. I cannot then recommend this method, unless the adhesion be slight, the edge of the iris free, and the lens and capsule transparent.

The operation, as recommended with the scissars, may be attempted in the manner recommended by Demours, as opposed to Maunoir and Scarpa, and described page 21; and the blunt pointed scissars may be again introduced, and the artificial pupil enlarged towards the centre of the iris; but I think the operation of separation at the ciliary ligament, with excision or subsequent strangulation in the wound, is in most instances, the most applicable to this peculiar state of eye. If, in any of these operations, the lens should be found opaque, it may be either extracted by enlarging the external opening, or the capsule may be ruptured, its texture opened into, and allowed to remain in situ, for absorption. If it should become opaque in consequence of the operation, its texture may be opened in the same manner, by a fine needle introduced through the cornea or sclerotica, and the lens allowed to remain in like manner, for absorption.

I have a case now under treatment, in which the lens has become opaque after the lapse of a twelvemonth. I have merely opened into its texture, with a needle introduced through the cornea, and have allowed it to remain for gradual absorption.

I have thought proper to include a peculiar morbid state of the eye in this section, because the cornea is affected in it, as well as the iris. It is the state alluded to in page 8; in which Cheselden and Sharpe recommended the incision in the iris to be made a little above or below the transverse diameter of the eye, in order to avoid the lens, which they supposed to be smaller in the opaque than in the transparent state. I have there said, that this opinion was probably adopted from generalizing too much; and that had Cheselden lived, a wider range of experience would have induced him to alter it; for he must have discovered, that although this might be the case in some instances, still they were but in a very small proportion to those in which the lens was of a natural size. This opinion of Cheselden, repeated by Sharpe, has been pronounced to be erroneous, and it has been said that he could not make an aperture in any part of this membrane, (the iris) which would not be obstructed by the opaque lens. Cheselden was however right, and it is the opinion of later authors, that is erroneous; for although

a contraction or closure of the pupil does not commonly arise from inflammation of the iris, and not from any disease of the lens; still, when once that inflammation is established, that man is more than hardy who will say where its effects shall terminate; the lens may then be diminished in size, or it may have been originally preternaturally small; the capsule and hyaloid membrane may be opaque, and the cornea may or may not be implicated; but I hold it to be a fact of some importance, that the chance of the more internal parts of the eye being sound, is greater in a case of closed pupil, after inflammation of the iris, complicated with derangement of the cornea, than when the external tunics have been unaffected; because the unfortunate termination has been in all probability, the result of neglected, rather than of obstinate disease. The state alluded to by Mr. Cheselden, will, I think, in general be found of this description; the cornea is for the most part opaque, particularly at the centre, the pupil closed, the lens diminished in size, and appearing through the iris, which is attached to the central opacity of the cornea, the aqueous humour keeping the outer circle of the iris, nearly in its usual situation, which membrane, excepting where it is attached to the lens, preserves its natural appearance. The principal of any operation which can be recommended, must be to make an

opening above, or below a lens, under such circumstances; for any attempt to remove a lens so firmly attached, would in all probability be unsuccessful, and must be useless from the opacity of the cornea. When the only transparent part of the cornea, is at the upper part, the iris must be separated from the ciliary ligament, or divided at that part as Mr. Cheselden recommended. That the operation is practicable, and that a person suffering from such derangement should not be abandoned, or this morbid state denied, or treated as fabulous; and that Cheselden's opinion was founded on fact, I have a living instance in proof, in the person of a young woman, who applied to me at the Infirmary for advice. Eight years ago she suffered an attack of inflammation, from which she lost one eye, and the sight of the other. Three years afterwards, when Assalini was in this country, he attempted an operation on the eye, which retained its natural shape, but without success, and she remained blind. Two years afterwards, she placed herself under the care of Mr. Alexander, who by an operation on the same eye, restored her to a degree of sight, which is to her inestimable, but for the improvement of which she lately applied to me.

The central part of the cornea is opaque, the rest not transparent, but clouded, the

disk and surface of the lens, is seen attached to the iris, which is adhering to the opaque part of the cornea; the greater circle of the iris is nearly natural, and immediately above the upper edge of the lens, precisely at the spot Mr. Cheselden has mentioned, a small but good artificial pupil has been made, through which she sees sufficiently well to guide herself about. The slight and subsequent increase of opacity of the cornea, for which she requested the advice of my colleague Dr. Forbes, and myself at the Infirmary has been removed, and she is enabled to distinguish fully as well, if not better than she has done, since sight has been restored to her through the judgment and dexterity of Mr. Alexander.

SECTION e.

The state d combined with a staphyloma of the cornea, in a greater, or less degree, the lens being present or having been removed.

In this morbid state of eye, the whole derangement is the consequence of inflammation terminating in ulceration, or sloughing of a part of the cornea. The inflammation may be of various kinds, although the result is in all very similar. I have in several instances observed it as sequela of the purulent ophthalmia of children, but in them it seems to take on the characters of staphyloma of the cornea, in which that tunic increases considerably in thickness, as well as in magnitude, protruding from between the eye lids, and causing considerable irritation. When in this state, an operation is requisite, merely for the sake of convenience. Scarpa recommends in such cases of staphyloma, that the apex of the tumor only should be removed, but from finding this ineffectual, I now remove it very much towards its centre; for the cornea becomes so thick towards the apex, or the more prominent part of the tumor, and is so

adherent to the iris, that removing a small portion hardly opens into the chamber of the eye, and does not sufficiently remove the deformity. The capsule of the lens should then be punctured, and the lens evacuated by gentle pressure, when the whole heals without any application, and with but trifling inconvenience, even when done on infants. In a case of this kind, the upper part or side of the cornea, often remains thin and transparent, and an artificial pupil may be made in it, of some use to the sufferer if he should be blind of both eyes.

In adults, the staphylomatous affection is frequently not so much dependent on this derangement and thickening of the cornea, as on the protrusion of the iris taking place through an opening in the cornea, the consequence of sloughing, but which procidentia iridis is subsequently covered over by an opaque layer proceeding from the cornea; giving to the eye the appearance of a partial, rather than to a complete staphyloma of the cornea. In this case the upper third of the cornea, is for the most part tolerably, if not entirely transparent, the iris is seen through it with its fibres fully on the stretch, closely applied to its internal surface, without any interposition of aqueous humour. In most of these cases, the eye may be amaurotic, and an operation useless, but it is not so in all, and an operation

should be attempted if the patient be blind of the other eye, merely on the chance of giving relief, although without any well grounded hope of success. I lately operated in a case of this kind with success, on a poor man a patient at the Infirmary: a puncture was made in the cornea, with a sharp pointed instrument, sufficiently large to admit a common cataract needle with only one cutting edge, and a round blunt point; this being passed flat in front of the iris, and between it and the cornea nearly to the opposite side, the edge of the instrument was turned to the iris, and an attempt made to cut it, which did not, although repeated, completely succeed, two small openings being made. The wound in the cornea was now a little enlarged, and Mr. Stodart's lancet edged scissars introduced, with which an opening was completed of sufficient size; the vitreous humour in a healthy state, now pressed in between the edges of the incision of the iris, which separation I encouraged as much as possible, by pressing on the edges of the iris, with the side of the knife. The patient says he sees well, and that his eye has been rendered very useful to him.

SECTION *f*.

Either, or, all of the three last varieties of disease combined with central opacity of the cornea, so dense and large, as to leave only a narrow transparent ring, the aqueous humour not being entirely wanting.

THIS state of eye is generally the consequence of acute inflammation, which has terminated in ulceration or sloughing of the cornea, and protrusion of the iris; the only part of the cornea which remains transparent, being at the edge, and the only part of the iris perceptible, being little more than that which covers the ciliary processes. A permanent opening is to be made in this part, without injuring if possible the cornea; and that operation seems a priori to be the best, which will enable the operator to do this, with the least danger and the least inconvenience to the patient. Excision has been recommended by Mr. Gibson, a vertical division by Sir W. Adams, and separation at the ciliary ligament by the continental authors.

This state of eye is frequently met with, and deserves attentive consideration. The nature of the inflammation which caused the derangement, as well as the present state of the eye, are both objects of enquiry and strict observation.

If the inflammation has been simple, and run its course in a short time, its sequelæ having assumed their present appearance with as little inconvenience as possible; without leaving any chronic inflammation or irritation of the eye, and its appendages, or any morbid vascularity of these parts; the prospect of success is favorable: whilst it is the reverse in the proportion in which any of these appearances prevail. It is particularly so, if the iris appear morbidly vascular, or the only remaining transparent part of the cornea, should seem to be softer, less transparent, less colourless, or more vascular than natural; for in this case, the cornea is disposed to become opaque from previous disease, and any opening that may be made in it, will cause a general muddiness of the transparent part not easily dissipated, and seldom so completely, as not to leave some permanently additional opacity. The operation by excision which is in some instances practicable, is quite prohibited in a case, in which there is any tendency to disease of this nature; for although a competent opening in the iris may be effected, yet the small puncture in the cornea, will render that part more opaque, than if it had been previously healthy, and will by preventing the passage of the rays of light to the retina, render the operation, unavailing; and a repetition of it would add still further to the evil.

If on the contrary, the eye has entirely recovered from the inflammation which caused so much mischief, no appearances of chronic irritation remaining, the transparent part of the cornea looking perfectly healthy, and the iris evidently separated from it by aqueous humour, the operation of excision may be attempted; and it will sometimes succeed, although it will much more frequently fail. When it does succeed, the pupil will always be small, and vision by no means good, although certainly very useful.

I have had two cases under my care, in which the operation was done in this way, but they were not so satisfactory as I could have desired: and upon the whole, I can only recommend this method, in cases where from the state of the constitution, unhealthy or excessive inflammation might be expected, from the separation of the iris at the ciliary ligament, which appears to me to be the preferable, although the most dangerous operation.

A vertical division of the iris, is by no means applicable in my opinion, to this state of disease, it is not easily effected, does not make so large, or so good an opening as is made by the separation at the ciliary ligament, and is equally liable to cause inflammation: I know that it may be done, but I do not think it less dangerous, and it is certainly less advantageous to the patient, than the coredialysis.

SECTION *g*.

The states included in f. the iris in contact with the cornea, a segment of a narrow ring at the edge being alone transparent, and the anterior chamber obliterated.

THIS state of derangement explains itself, and there is but one method of operating, which offers to the sufferer a chance of relief, and that is the coredialysis, at whatever part the cornea may be transparent.

The cornea is to be opened by a perpendicular incision, to the extent which may be considered necessary for the easy introduction of the coreoncion of Langenbeck; for which instrument see plate 2, figures 1, 2, 3, 4. This opening may be made, if necessary, in the opaque part, and the coreoncion is to be introduced through it, and insinuated between the iris and cornea, until it reaches the edge of the iris, as seen through the cornea. The operator has his thumb on the knob of the instrument *b*. figure 4, and the hook which is projected at *c*. fig. 2, is retracted to the edge of the gold tube marked *b*. so that the point of the hook rests against the edge of the tube, and cannot catch the iris, either on introducing or withdrawing it. The point of the hook being turned towards the iris, (which has been previously ascertained by its correspondence with the knob in the shaft of the instrument, regulating it) is to be projected a little, and affixed by pressure, into

the iris ; the operator now allows the knob regulating the hook, to recede slowly, and he will perceive that the iris has begun to separate; which separation is to be completed by withdrawing the whole instrument from the eye, bringing with it the iris, grasped between the hook and the end of the gold tube, as if held in a pair of spring forceps. If only a small portion can or has been drawn out, the operator allows it to be strangulated in the incision, which must be small for this especial purpose, never exceeding two lines in length; or, if a larger portion has been drawn out, he cuts it off close to the incision in the cornea, leaving however sufficient to be strangulated in it, so as to prevent its receding ; or he cuts off a larger portion at once, as in the operation by excision, and allows the iris to recede entirely. If no portion of the iris is to be removed, after the instrument has been withdrawn holding the iris in its grasp, the hook is to be again projected, when the forceps like seizure being taken off, the hook can be readily disengaged. The eye in either case, is now to be closed, and the case treated as one of procidentia iridis ; but the operator must expect as much or even more inflammation than usually takes place in either of the other operations, whether the iris be strangulated, or in part removed.

I have performed the operation in this manner, in two instances ; the instrument answered

perfectly, the operation was completed in as short a time as that by excision, and very little blood indeed was effused into the chamber of the aqueous humour ; but the subsequent inflammation was serious, and required a vigorous antiphlogistic treatment. The strangulated part of the iris is in this case under treatment.

The operation performed in this manner, will I conceive supersede every other method hitherto adopted for the coredialysis; even at the upper part of the eye, where the iris is not likely to return to the ciliary ligament, if the separation has been completely effected. In using the instrument in a case where the lens is transparent, all injury to it from the point of the hook, must be prevented, by turning it slightly on its axis after the separation has commenced, by which the lens will be completely avoided. Of all the instruments which have been recommended for the coredialysis, I think the coreoncion of Langenbeck is the best. It unites the necessary qualities, of ensuring a separation of the iris, without letting go its hold until the prolapsus is completed, of being very fine at the point, so that it may be introduced through a small opening, and easily carried on to the ciliary edge of the iris, however diminished the anterior chamber may be, and of being so easy of introduction and abduction, that it cannot catch in the cornea, or wound the iris.

SECTION *h*.

Other anomalous states, not included in the above, but requiring some modification in the mode of operating.

In this section may be included that state of eye, in which the cornea has become entirely opaque, so as to preclude the possibility of making an artificial pupil in the iris, which in all probability is closely attached, if not adherent to the cornea in almost every part. It is a case hitherto supposed to be hopeless. Professor Autenrieth of Tubingen, conceived however, that it might be possible to make an artificial pupil through the sclerotica, by which a certain degree of vision might be obtained. He made the experiment on dogs, and says he succeeded, upon which authority, Bëer tried it in one case, on a person whose cornea was completely opaque, but failed. I have also tried it in one instance, but with an equal want of success. The operation which is called sclerotikectomia by the Germans, has been made the subject of a treatise at Tubingen, by L. Schmidt, but which I have not seen.

When the cornea sloughs out at its circumference, which it frequently does in neglected

cases of purulent ophthalmia, (ophthalmo blennorrhœa of foreign authors,) the iris is not destroyed, neither does the lens always escape, but the eye remains tolerably full, allowing for the loss of the cornea, and the chamber of the aqueous humour which gives it a flattened and diminished appearance. In some of these cases the opening left by the sloughing of the cornea, is not closed up by an opaque substance, but a new membrane or substance is formed over and adhering to the iris, the pupil in which as well as the iris itself, can be seen through it, the patient being often able to distinguish light from darkness. I have an old woman under my care, whose eyes became affected by the purulent discharge from the eye of a new born infant, and before she applied for advice, the cornea in both eyes had sloughed at the circumference; the anterior part of the ball is now covered over in the manner I have described, the covering substance having the appearance of a thin lamen of horn. The same thing takes place in a protrusion of the iris, which always obtains a covering of this sort, but more or less opaque, from the cornea; and where repeated attacks of ulceration have affected the cornea, so as to leave it irregular on its surface, a semi transparent spot of altered cornea apparently of the nature alluded to, is often left seated in the midst of an irregular rough opacity, and through which

the patient can see sufficiently well to guide himself about. I have a case of this kind also under my care, and although an artificial pupil might possibly be formed at the outer edge of the cornea, still I consider it improper to recommend it; because it would most probably not succeed, and the patient would lose the little sight he at present enjoys. The eye has suffered too much disease to be capable of supporting the slightest increase of action, without falling into complete disorganization.

It was from having seen this new membrane, or substance repeatedly form, that I was induced to perform the operation alluded to. The poor man had lost the sight of both eyes, the right however retaining nearly its natural shape, although soft to the touch. A curved needle with a cutting edge was passed under the sclerotica, close to the cornea, with the convex part towards the eye, and made to cut itself out, by which a small flap was made in the sclerotica, and which was enlarged by the blunt pointed iris scissars, until an irregular triangular opening was made, nearly of the size and shape of the artificial pupil in fig. 3, plate 1. The choroid coat was next attempted to be removed, but it was not effected to the same extent as the sclerotica, and in doing it, the hyaloid membrane was punctured, (which ought, if possible, to be avoided) and a small quantity of fluid vitreous humour escaped. The

patient declared at the moment he could see light much more strongly, and could even distinguish the window, which gave me some hopes of success. No inflammation followed, but the sclerotica gradually closed in, and the new substance which formed is so opaque, that the person has derived no benefit from the operation.

Although this case has failed, I shall not abandon the attempt at restoring some degree of vision in such unfortunate cases, until I am convinced from further trials, that it will not succeed; no harm can be done, whilst the good resulting from it may be invaluable. The sounder the internal parts of the eye are, the greater the probability of success, for a larger opening may then be made in the sclerotica and choroides, without so much danger of the vitreous humour escaping, or of a serious degree of inflammation taking place.

CONCLUDING OBSERVATIONS.

FROM the observations which have been made in the preceding pages, on the different states of derangement of the eye, rendering the formation of an artificial pupil necessary, the necessity as well as the propriety of adopting several methods, will be acknowledged. I do not think the methods by division, or excision admit of, or, are capable of much improvement in the simple cases, although some alteration may be hereafter made in those which are more complex. There is however, one point connected with the operation of division, which requires further remark, for it will naturally be asked, how it happens, that a division of one third of the diameter of the iris, is now found sufficient to form a permanent artificial pupil, whilst a division of it to the same extent a few years ago, was not sufficient, the opening then made being found to close. If reference be made to the observations of Janin, Sharpe, &c. at the commencement of the book, it will be found

that the operation of Cheselden, was abandoned because the newly formed pupil, (through which the patient saw at the time,) was found closed, when the eye was examined after a lapse of several days, the usual period of removing the coverings from it. There must be some cause for this difference, and without entering into the discussion, of whether the iris possesses muscular fibres arranged in a circular and radiated form, to act as antagonists to each other, as Maunoir has represented, or whether the iris acts on the principle of erectility, as the editors of the Dictionnaire des Sciences Medicales, and many of the German authors would wish us to believe, or whether it acts from a principle of contractility, different from either; I will venture to assert, that the closure of the pupil, in all these cases, took place from sufficient attention not having been paid to prevent or subdue inflammation; for a much less degree of inflammation will cause a closure of the artificial pupil, than will give rise to symptoms after extraction of the cataract, demanding particular attention. I attribute then the difference in our success to that of Janin, to this cause, and have therefore expressed myself, when on the subject of the after treatment, so decidedly as I have done, that the error may, if possible be avoided.

The operation of separating the iris at the

ciliary ligament, is yet but in its infancy, although much has been done within these last few years: and it seems still strongly to attract the attention of the German practitioners. There appears to be but one opinion among them, as to the propriety of doing it through the cornea, instead of the sclerotica; and in this, I perfectly agree. There is a difference of opinion as to the propriety or advantage of excision over strangulation, and vice versa. I am, for my own part, disposed to prefer excision, because it does not keep up so continued an irritation on the iris as the strangulation does, and the patient recovers much sooner. The necessity for blood-letting I think must be less; but the practice of the continental authors on this subject, can assist us but little in forming our opinion, for an injury which will produce excessive inflammation in a Briton, will often times only excite moderate irritation in a foreigner; although the Germans do perhaps approximate nearer to our standard of health than any other nation. I have seen this fact so often demonstrated during my campaigns that it is to me no longer doubtful.

For the opinion of the respective supporters of the coredialysis, according to the different methods of doing it, I refer to the commencement of the work.

FINIS.

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REFERENCES TO PLATES.

PLATE I.

Fig. 1. An Artificial Pupil of a large size, formed by dividing the iris with the knife, (Coretomia) in which the capsule and shrunk lens remain attached to the lower edge of the newly formed pupil.

2. The appearance of an Artificial Pupil, formed in the eye of a man, at the Infirmary, who had been 24 years blind of both eyes. The capsule was thickened and adherent to the iris, which accounts for the narrowness of the pupil; the lens was opaque. He saw extremely well.

3. Taken from Scarpa to shew an Artificial Pupil formed by the scissars; the opening in the cornea being marked by a line, the segment of a circle.

4. The appearance of a good sized pupil made by excision of a portion of the iris.

5. A separation of the iris from the ciliary ligament, the consequence of a blow.

6. This separation imitated by art. The letters *a* and *b* being intended to give an idea to the student of the place where the opening is to be made in the cornea; and of the cicatrix which must remain in the cornea, if the iris be strangulated in it.

The instruments which have been recommended in this work, may be obtained correctly made, from Mr. Stodart, 401, Strand; Messrs. Savigny, Everill, and Mason, St. James's Street: and Mr. Weiss, Strand, opposite Bedford Street.

PLATE II.

Figs. 1. 2. 3. 4 The coreoncion of Langenbeck in four parts, to shew its mechanism.

Fig. 1. The shaft of the instrument, *a*. the screw worm to which the cap or end Fig. 2 is affixed, *b*. the projection or ring against which the finger rests to steady the instrument; *c* the opening in the shaft to admit the motion forwards and backwards of the knob *b*. Fig. 4.

2. *a*, the end of the instrument which fits on to the screw in the handle *a*. Fig. 1, and containing the hook.
b. a fine gold tube only large enough to receive the hook.
c. the hook which can be projected for two lines only
d. The shaft of the hook by which it is affixed in the spiral wire, fig. 4.

3. This figure shews the golden tube and hook separated from the handle or shaft of the instrument.
a. the joining of the golden tube. *b*. the hook and shaft.

4. The spiral spring made of wire, which is received into the shaft of the instrument, fig. 1.
a. the ring in which the moveable knob *b*. is affixed, after the spring has been introduced.

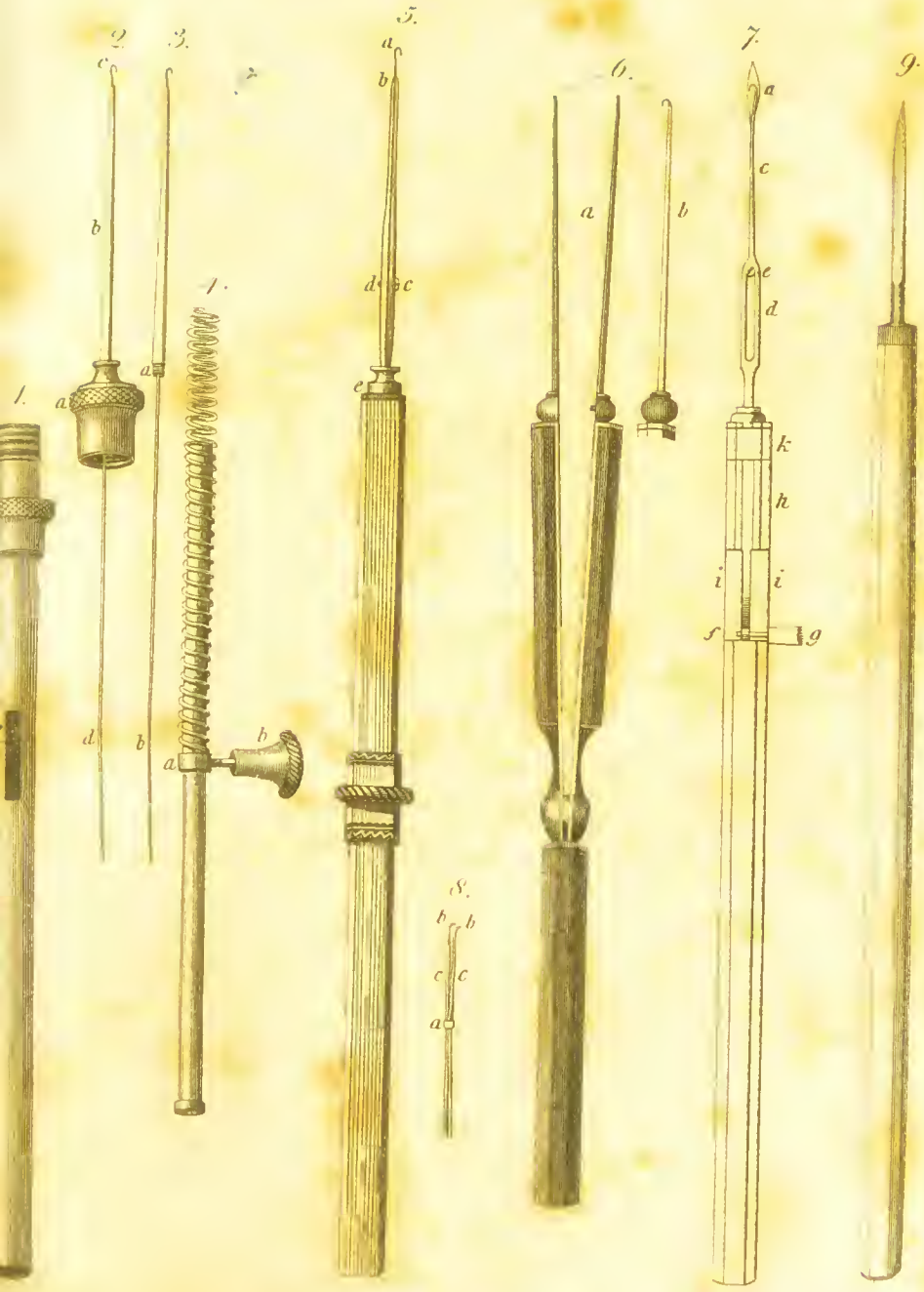
5. The Iriankistron of Dr. Schlagintweit.
a. the hook.
b. the slider, making, when pushed forwards to the hook, a kind of forceps.
c. the screw which being put through a small groove in the slider, and fastened to the neck of the hook at *d*, admits of the slider's or forcep's blade being pushed forwards or drawn backwards to the extent of the groove, or hollow that the neck of the screw plays in.
e. the ring or joint which unites the different parts of the instrument.

6. *a*. Dr. Reisinger's double hooked forceps.
b. a single limb, side view

7. Dr. Embden's Raphiankistron
a. the straight cataract needle in the shape of a lancet, on the surface of which, the hook lies. The instrument is delineated in the state in which it is to be used. *c*. the hook and needle fitting so closely, as to form but one shaft. *d*. the opening in the broad part of the neck of the hook. *e*. the screw by which the hook is so connected with the needle, as to admit of its being moved backwards and forwards. *f*. the end of the neck of the hook, provided with a hole into which the knob *g*. is received. *h* the part of the neck of the hook which lies in a hollow of the handle. *i. i.* a flat surface in the handle, which is as deep as the hollow, in order to allow the knob to be fixed on either side. *k*. the ring under which the neck of the hook may be freely moved.

8. Gräefe's Corconcion, or double hooked forceps.
a. the moveable ring, which closes the hooks
b. b. the two hooks
c. c. the two shafts or limbs of the hooks.

9. The iris scalpel of the middle size of the shops, being the largest which should ever be used in the operation for dividing the iris; pointed but cutting only on one side.



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